SILKOSTAT 9210

INSTRUCTION MANUAL
Notice for readers

The information contained in this manual was as complete and exact as possible at the time of printing. If the behaviour of this product during its use is different from that described in the documentation, it is perhaps because your manual is out of date. In this case, please contact your Polymetron agent immediately to remedy the problem.

If the instrument is used in a way not specified by the manufacturer, the protection ensured by the instrument could be compromised.

Polymetron reserves the right to make modifications and changes to the equipment and software comprising the product described in this manual.

Thank you.
Safety Precautions

Please read this entire manual before unpacking, setting up, or operating this instrument. Pay particular attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that which is specified in this manual.

Use of Hazard Information

If multiple hazards exist, this manual will use the signal word (Danger, Caution, Note) corresponding to the greatest hazard.

**DANGER**

*Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.*

**CAUTION**

*Indicates a potentially hazardous situation that may result in minor or moderate injury.*

**NOTE**

*Information that requires special emphasis.*

Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to this instrument could occur if not observed.

- ![Warning Symbol](image)
  
  This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.

- ![Ground Symbol](image)
  
  This symbol, if noted on the instrument, marks the wiring connection point for Protective Earth.

- ![Eye Protection Symbol](image)
  
  This symbol, if noted on the product, indicates the need for protective eye wear.
Maintenance

The integrity of electrical connections and protection instruments of the system should be checked periodically. All necessary measures should be taken to remedy any inadequate condition.

Service and repairs

None of the instrument's components can be serviced by the user. Only personnel from Polymetron or its approved representative(s) is (are) authorised to attempt repairs to the system and only components formally approved by the manufacturer should be used. Any attempt at repairing the instrument in contravention of these principles could cause damage to the instrument and corporal injury to the person carrying out the repair. It renders the guarantee null and void and could compromise the correct working of the instrument and the electrical integrity or the CE compliance of the instrument.

If you have any problems of installation, starting or using the instrument please contact the company that sold it to you. If this is not possible, or if the results of this approach are not satisfactory, please contact the manufacturer's Customer Service.

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Tél. + 33 148 158 080
Fax + 33 148 158 000
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<td>45</td>
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</tbody>
</table>
1. Presentation of the instrument

Figure 1
Operation

The 9210 can analyse up to six different samples. The sample to be analysed circulates in a fast loop permitting rapid renewal of the sample. Adjustment of the flow is carried out with the help of a needle valve (2). At the beginning of the analysis, the sample is introduced into the measurement cell (4) with the help of a solenoid valve (5).

The 1st reagent is added with the pump (9). The silica contained in the sample now reacts with the molydate and forms the silicomolybdic complex. The reagent time is relatively long.

Oxalic acid is then added to avoid the interference of phosphates and to intensify the colour.

The silicomolybdic complex is reduced to a blue molybdenum complex by means of ferrous ions. A photometric measurement is carried out at the end of the reaction.

Calibration

In order to ensure correct functioning, the analyser should be calibrated periodically. The zero is realised chemically and internally in the analyser. The system slope is controlled in comparison to a standard solution of known concentration.
2. Technical specifications

Specifications

Measurement range (two different versions):
- 0 – 5000 ppb
- 0 – 1000 ppb

This instrument complies with the following standards:
- Immunity to electromagnetic interference: EN 50082-2 et EN 50082-1
- Electromagnetic emissions: EN 50081-1 et EN 50081-1
- Low voltage standard: IEC61010-1

SAMPLE

Number of channels: 1 – 6
Measurement cycle: < 10 min / channel
Sample pressure: 0.2 to 2 bar
Temperature: 5 - 50 °C
Sample flow: 10 to 20 l / hour

CONNECTIONS

Sample admission: tube PE Ø 4/6
Sample evacuation: tube PE Ø 10/12

CONDITIONS OF USE

Ambient temperature: - 5 to + 50°C
- use inside
- fluctuations ± 10 % of the power supply voltage
- overvoltage category 2
- degree of pollution 2 (according to CEI 664)

Altitude: ≤ 2000 m
Relative humidity: 10 to 80 %
ANALYSIS

<table>
<thead>
<tr>
<th></th>
<th>dissolved SiO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value measured</td>
<td></td>
</tr>
<tr>
<td>Measurement field</td>
<td>0 – 5000</td>
</tr>
<tr>
<td></td>
<td>0 – 1000</td>
</tr>
<tr>
<td>Repeatability</td>
<td>± 2 % or ± 2 ppb</td>
</tr>
<tr>
<td></td>
<td>± 2 % or 0.5 ppb</td>
</tr>
<tr>
<td>Detection limit</td>
<td>&lt; 5 ppb</td>
</tr>
<tr>
<td></td>
<td>0.5 ppb</td>
</tr>
<tr>
<td>Cycle time</td>
<td>≤ 10 minutes per channel</td>
</tr>
</tbody>
</table>

INPUTS / OUTPUTS

Alarms
- Number : 8
- Functions :
  - 6 threshold relays
  - lack of sample
  - active channel
  - System alarm
  - 3 contacts
  - 1 warning relay
- Cut-off power : 30 VDC, 0.5 A maximum

Logic inputs
- Number : 12
- Remote clearance
- Inhibition of samples

Serial input interface
- RS 485, Modbus communication protocol

Outputs 4 / 20 mA
- Number : 8
- 4/20 mA / 0/20 mA programmable.
- Galvanically insulated
- Maximum charge of 800 ohms

MATERIALS & PROTECTIONS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
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<td>Aluminium with polyester paint</td>
</tr>
<tr>
<td>Panels and other boxes</td>
<td>Polystyrene</td>
</tr>
<tr>
<td>Protection transmitter box</td>
<td>IP 65</td>
</tr>
<tr>
<td>Protection cabinet (optional)</td>
<td>IP 54</td>
</tr>
<tr>
<td>Cabinet front door</td>
<td>Plexiglas</td>
</tr>
</tbody>
</table>
SILKOSTAT 9210

MAINTENANCE

Calibration  Chemical zero, slope with calibration solution

Maintenance  No particular maintenance is necessary. Cleaning can be done with a soft non-aggressive cloth.

Reagent consumption  Approx. 1 l per month and per reagent

Calibration solution consumption  Approx. 200 ml / calibration

Time safeguard lithium battery  CR 1220 (3 V)

Caution:
There are risks of explosion if the replaced battery does not correspond to the correct model.
Do not throw away used batteries in the dustbin. Send to a recycling centre.

TRANSMITTER

Display
• Programming by menu.
• Concentration of 6 samples.
• Analyser status.
• Alarms.
• Trend curves.
• Concentration historic
• Calibration parameters historic (date, slope and offset).

MAINS POWER SUPPLY

Mains
• 100-240 VAC 50-60 Hz.
• automatic switching.
• Max. consumption: 80 VA.
Analyser Dimensions

**Figure 3**  Dimensions of the analyser – Panel version

A: Mains power supply cable gland, drilled 11, $\varnothing$ 5 to 10mm, 100…240V, 50-60Hz, 25VA

B: Field bus cable gland, drilled 13, $\varnothing$ 6 to 12mm

C: 5 to 7 mm cable gland
   * Alarm signals : 30V, 0.5A max.
   * Logic inputs : Inhibition on channels 1 to 6, acknowledgement of alarm signals
   * Analogue outputs : 0-20 mA or 4-20 mA

D: Samples inlets, (channels 1 to 6), QR coupling for semi-rigid tubing, $\varnothing$ 6mm
   5 to 50 °C (40 ° to 120 °F), P 0.2 to 6bar (3 to 87 PSI)

E: Drain tube : silicon tubing, $\varnothing$ 12 x 17mm, at atmospheric pressure
Figure 4  Dimensions of the analyser – Cabinet version

A :  Cable gland, 5 to 7mm  
* Mains power supply cable gland, drilled 11, Ø 5 to 10mm, 100…240V, 50-60Hz, 25VA  
* Field bus cable gland, drilled 13, Ø 6 to 12mm  
* Alarm signals : 30V, 0.5A max.  
* Logic inputs : Inhibition on channels 1 to 6, acknowledgement of alarm signals  
* Analogue outputs : 0-20mA or 4-20mA  

B :  Samples inlets (channels 1 to 6), QR coupling for semi-rigid tubing, Ø 6mm  
5 to 50°C (40° to 120°F), P 0.2 to 6 bars (3 to 87 PSI)  

C :  Drain tube : silicon tubing, Ø 12 x 17mm, at atmospheric pressure.
3. Installation

Unpacking

The instrument should be unpacked with care. Be careful not to mislay the accessories during unpacking.

**Caution:**

- Assembly should not be carried out by non-qualified personnel.
- The power supply should not be connected until the installation has been completed and checked.

Inspection

The instrument has been tested and checked at the factory before shipping, however it is advisable to carry out a visual inspection to be sure that it has not suffered any damage. Damaged packaging could mean the presence of damage not immediately visible. Keep the packaging in case of complaints. For any missing parts or accessories, please contact your distributor.

Pre-installation

Before installing the analyser, think about the following precautions:

- Place the analyser close to a sample point. The sample should be homogenous and representative. This will allow the response time to be reduced. The temperature of the sample should be between 5 and 50°C. The pressure of the sample should be between 0.2 and 2 bar and remain relatively stable. The solution should be free of particles. The sample lines should be in PE/PTFE/FEP (⌀ 4 x 6 mm).

- Avoid any location with a corrosive atmosphere or subject to liquid spills.

- Chose a dry and dust-free location.

- The ambient temperature of the analyser should not exceed 50°C. If the temperature is below 5°C, the analyser should be installed in a heated cabinet.
Presentation of the analyser

Figure 5  Analyser front panel

1 - Monec transmitter box  
2 - Sample level detector  
3 - Overflow vessel  
4 - Sample 1 to 6 flow adjustment valves  
5 - Photometric measurement cell

Figure 6  Analyser rear panel

6 - Local controller box  
7 - Measurement solenoid valve  
9 - Measurement box  
10 - Sample inlet valves  
11 - Drain
Positioning the canisters

A canister holder is supplied with the analyser, it is fixed as shown in the figure below.

In all cases, respect the maximum height between the measurement cell and the canister.
Connecting the sample

Use new pipes for connecting the installation

- exterior Ø: 6 mm imperatively
- Material: polyethylene or PTFE or FEP
- Pressure: 0.2 to 2 bars (0.5 to 6 bars optional)
- Temperature: 5 to 50°C

At this stage of the installation, make sure that the flow valves (2) are all closed.

The connection of pipes is done by insertion into the quick release connections found under the sampling block.

Figure 8  Connecting the sample

Connecting the evacuation (drain) tube

The connection of the pipe is located on the bottom of the analyser and is carried out by the user with the help of a 12 x 17 mm pipe delivered with the instrument. It should be at atmospheric pressure and not be looped.

Caution:

Evacuation should be free of any mechanical constraints, and free of any counter-pressure.
Mains power connection

The electrical installation should be carried out by duly qualified personnel. A supply voltage of 100-240 VAC is acceptable without changing the configuration. The power supply terminals can be removed from their housing to make connection easier.

For safety reasons, it is imperative to respect the working procedure below:

- Use a three-wire power lead (line + neutral + earth) sized for supplying the required power.

- The instrument should be connected to the mains via a circuit-breaker or fuse whose value should be less or equal to 20 A. It should be located in proximity and be identified.

- This connection should cut-off the phase and the neutral when electrical problems occur or when the user wishes to intervene inside the instrument. On the other hand, the earth conductor should always be connected.

**Danger:**

No intervention should be carried out on the instrument without first switching off the power.
The connection of mains is found in the transmitter box.

To gain access:

- Unscrew the 4 screws from the front panel.
- Rotate the front panel.
- Remove the shielding plate.
- Pass the wire through the transmitter cable gland (from the panel back side).
- Remove the terminals and screw up the wires.

**Figure 10 Position of mains connection and the fuse**

Fuse
T2 AL – 250 V
according to CEI 127
RS485 connections (optional extra)

- open the transmitter with the 4 screws.
- Install the communication module as described on figure 9 (item 3).
- pass the cable through the transmitter cable gland.
- connect RX/TX+ and RX/TX- (connector is on the optional board figure 3.5 item 3).
User signals connections

This box is found on the back of the SILKOSTAT on the top (see figure 1.2 item 6).

Unscrew the 4 screws of the cover to gain access to the terminals.

*Note:*
The cable glands mounted on the “local controller box” should be perforated with a screwdriver before being used.

To ensure a good seal, the external diameter of cables should be between 5 and 7 mm.

**Danger:**
The relay outputs can only supply power in very low safety voltage (30 VAC Or 42.4 Vdc maximum) and limited to 0.5 A.
<table>
<thead>
<tr>
<th>Connections</th>
<th>Function</th>
<th>Max. voltage</th>
<th>Max. current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mixer control</td>
<td>24 Vac</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td>Heater control</td>
<td>24 Vdc</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td>Cell temperature measurement</td>
<td>5 Vdc</td>
<td>1 mA</td>
</tr>
<tr>
<td>Re1 to Re6</td>
<td>User relay of threshold 1 to 6</td>
<td>30 Veff ou</td>
<td>0,5 A</td>
</tr>
<tr>
<td>Re7 to Re10</td>
<td>Not used in this application</td>
<td>42.4 Vdc</td>
<td>resistive charge</td>
</tr>
<tr>
<td>Re11</td>
<td>Warning alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Re12</td>
<td>System alarm (NO and NF switch are availables)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In1 to In6</td>
<td>Inhibition input (channels 1 to 6)</td>
<td>5 Vdc</td>
<td>5 mA</td>
</tr>
<tr>
<td>In7 to In10</td>
<td>Input not used in this application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In11</td>
<td>Remote acknowledgment of alarms</td>
<td></td>
<td></td>
</tr>
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<td>In12</td>
<td>Level sample detector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iout1 to Iout6</td>
<td>Analog output 0-20 or 4-20 mA (channels 1 to 6)</td>
<td>24 Vdc</td>
<td>23 mA</td>
</tr>
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<td>Iout7</td>
<td>Analyser status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iout8</td>
<td>Not used in this application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vout1</td>
<td>Sampling electrovalve control</td>
<td>30 Vdc</td>
<td>1 A</td>
</tr>
<tr>
<td>Vout2 to Vout7</td>
<td>Sample selection electrovalves control (channels 1 to 6)</td>
<td></td>
<td></td>
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<td>Vout8</td>
<td>Calibration pump</td>
<td></td>
<td></td>
</tr>
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<td>Vout9 to Vout11</td>
<td>Reagent pump P1 to P3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vout12</td>
<td>Drain pump</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
The system alarm relay (12) is in the positive safety position for informing in case of a cut-off or an analyser error.
4. Starting-up

Reagent preparation

Danger:
*Read the precaution and security appendix and wear protective goggles and clothes before use chemical products.*

Chemicals for 2 l reagent preparation

**Reagent 1:**
- Molybdate sodium 2H2O Merck 106521 or Fluka 106521 or equivalent : 100 g.
- Sodium hydrogenosulfate 1H2O Merck 106352 or Fluka 71657 or equivalent : 160 g
  or Sodium hydrogenosulfate anhydre Fluka 71656 or equivalent : 140 g.
- Concentrated sulphuric acid (Merck 731, Fluka 84721 or equivalent) : 50 ml.

**Reagent 2 :**
- Oxalic acid 2 H2O Merck 495 or Fluka 75700 or equivalent : 80 g.

**Reagent 3 :**
- Concentrated sulfuric acid Merck 731 or Fluka 84721 or equivalent : 25 ml.
- Mohr salt (ammonium ferro sulfate 6 H2O ) Merck 3792 or Fluka 09720 or equivalent : 40g.

**Preparation**

**Reagent 1**
Fill a 2 litres measuring flask to the 2/3 point with demineralised water (with the lowest silica content) as possible. Add 100 g of sodium molybdate under constant stirring.
Wait until all the ammonium molybdate is thoroughly dissolved.
Add the sodium hydrogenosulfate.
Wait until complete dissolution.
Carefully add 50 ml of sulphuric acid (measured using a burette or similar) under constant stirring.
Fill the flask to the 2 litres mark. Allow it to cool and then pour it into the 2 litres canister provided for this reagent.
Reagent 2
Fill a 2 litres measuring flask to the 2/3 point with demineralised water (with the lowest silica content) as possible:

- Add 80 g of oxalic acid under constant stirring, and allow it to dissolve completely.
- Fill the flask to the 2 litres mark and then pour the content into the 2 litres canister provided for this reagent.

Reagent 3
Fill a 2 litres measuring flask to the 2/3 point with demineralised water (with the lowest silica content) as possible:

- Add 25 ml of sulphuric acid under constant stirring (measured using a burette or similar).
- Add 40 g of ferrous sulfate and allow it to dissolve.
- Fill the flask to the 2 litres mark and then pour the content into the 2 litres canister provided for this reagent.

Calibration solution

CONCENTRATED SOLUTION

Use of Titrisol ® (Merck) cartridge

Dilute one cartridge of Titrisol ® Merck 9947 solution into one litre of demineralised water will give a concentration of 1000 mg/litre of Si, ie, 2139 mg/litre of SiO₂.

Dilute this solution, 100 times, ie, 10 ml in one litre. This will give a concentration of 10 mg/litre of Si, ie, 21.39 mg/litre SiO₂.

CALIBRATION SOLUTION

By diluting an appropriate volume of the concentrated solution (at 21.39 mg/litres) with demineralised water, various calibration solutions with a known concentration of SiO₂ may be prepared:

Suggestion for calibration solution preparation (for 2 litres)

<table>
<thead>
<tr>
<th>ml of concentrated solution 21.39 mg/l</th>
<th>calibration solution ppb Si</th>
<th>calibration solution ppb SiO₂</th>
<th>Instrument Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>50</td>
<td>107</td>
<td>0-200 ppb</td>
</tr>
<tr>
<td>20</td>
<td>100</td>
<td>214.9</td>
<td>0-200 ppb</td>
</tr>
<tr>
<td>25</td>
<td>125</td>
<td>267.4</td>
<td>0-500 ppb</td>
</tr>
<tr>
<td>50</td>
<td>250</td>
<td>534.8</td>
<td>0-1000 ppb</td>
</tr>
</tbody>
</table>
Positioning the canisters

Reagent tubings are tagged as 1 to 3. They come with an analyser and are fed through the special stoppers on the reagent canisters. One end of these pipes is fitted with a chemically inert, PVC strainer that is used to position the pipes in the bottom of the canisters.

Before starting analyser, it is necessary to connect each cap on its canister:

- Tubing No. 1 on the reagent canister R1: molybdate reagent.
- Tubing No. 2 on the reagent canister R2: Oxalic acid reagent.
- Tubing No. 3 on the reagent canister R3: Ferrous sulfate reagent.

Screw the cap on the canisters. Then, check that the strainer is resting in its proper position at the bottom of the canister. Put the canister on the canister-stand to have cap towards interior as shown figure 7

In the panel version, the canister-stand must be under the analyser panel. In the cabinet version, it is in the back part of the cabinet.

**Note:**

*The canisters must not be placed more than 30 cm from the lower part of the down of the panel to have a good reagent injection in the cell.*

Installation of the magnetic stirrer

Solution mixins is done by teflon coated magnetic stirrer, located in the lower part of the cell and driven by a brush-less motor. To avoid loss or damage in transit, the bar is not installed in the cell but may be found attached in a bag fixed around the drain pipe. When setting the equipment up, the stirrer must be inserted inside the cell.

To do so, remove the calibration solution pipe from its housing. This is the largest diameter tubing located on the front of the cell. Insert the magnetic stirrer through the hole in the cover revealed by the removal of this tubing. Then reposition the tubing.
**Modification of a value**

The highlighted digit may be modified with the key \[ \text{ } \]. Each digit can be modified by pressing ENTER. Repeat both operations for each digit.

**On the first digit : possibility to display the sign "."**

**On the others digits : possibility to display the sign "."**

**Note:**

If you do not use the keyboard for at least 10 minutes, the instrument returns to the measuring mode except for the calibration and maintenance mode.

An access code may be required for the calibration, programming and service menu (see CODE menu).
Language programming

Access to the menu:

- Press the "MENU" key.
- Choose "SERVICE" menu with the "select" function key and validate by "Enter".
- Choose "DISPLAY" menu with the "select" function key and validate by pressing "Enter".

Choice of the language, measures units and samples customize.

Use the key to change the selected digit and press the "Enter", key to validate the modification and select the next digit.

Languages available are:

- French : F
- English : GB
- German : D
- Spanish : Sp
- Italian : I

Unit choice is ppb or µg / l.

Time and date programming

Access to the menu:

- Choose the sub menu "TIME" in the menu "SERVICE" and validate by pressing "Enter".
- Use the key to change the selected digit and press the "Enter" function key to validate the modification and select the next digit.
Starting up the analyser

Access to the menu:

- Stop the analyser if it is analysing with the help of START/STOP function key.
- Press the "MENU" key.
- Choose "MAINTENANCE" menu with the "select" function key and validate by pressing "Enter".
- Choose "START UP" sub menu, press "Enter".

This menu allows two choices:

Adjustment of the samples flow

This adjustment is used to set up the flow-rates for the various channels. The sampling solenoid valve is open during this stage and agitation is continuous. The flow rate may be set by adjusting the screws on the front panel so as to fill the overflow vessel and guarantee a slight overflow.

The "Enter" key allows to access to the next sample.

x : n° of the sample (1 to 6).

Caution:

Don't completely unscrew the flow adjust screws. There is no stop screw, so it will provoke a sample leak

Pumps priming:

Immerge the different reagent tubings in the canisters.

Press OK when pipes of the different pumps are full of reagent.
Go back to "maintenance" menu.
Starting a measurement

With the help of the "Esc" function key, go back to the main screen and press "START" key.
5. Analyser programming

```
<table>
<thead>
<tr>
<th>MENU</th>
<th>CALIBRATION</th>
<th>PROGRAMMING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EXECUTION PRIMARY</td>
<td>OFFSET INTERVAL : xxx h</td>
</tr>
<tr>
<td></td>
<td>EXECUTION MANUAL</td>
<td>CAL. SOL.: xxx,ppb</td>
</tr>
<tr>
<td></td>
<td>PARAMETERS</td>
<td>AUTOMAT CAL.: NO</td>
</tr>
<tr>
<td></td>
<td>HISTORIC</td>
<td></td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>START UP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>REAGENTS REFILL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TUBES CLEANING</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EXTENDED STOP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PUMPS-OTHERS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SOLENOID VALVES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RELAYS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHOTOMETER TEST</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOGICAL INPUTS</td>
<td></td>
</tr>
<tr>
<td>MEASURE</td>
<td>MEASURING MODE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRAB SAMPLE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HISTORIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADC VALUES</td>
<td></td>
</tr>
<tr>
<td>ALARMS</td>
<td>ALARMS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALARM 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALARM 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALARM 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALARM 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALARM 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALARM 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WARNING ALARM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SYSTEM ALARM</td>
<td></td>
</tr>
<tr>
<td>mA OUTPUTS</td>
<td>mA OUTPUTS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AFECT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OUTPUT 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OUTPUT 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OUTPUT 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OUTPUT 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OUTPUT 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OUTPUT 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPECIAL PROG.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEST</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VALUE : xx mA</td>
<td></td>
</tr>
<tr>
<td>COMMUNICATION</td>
<td>COMMUNICATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BAUD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PARITY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BIT STOP</td>
<td></td>
</tr>
<tr>
<td>SERVICE</td>
<td>SERVICE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TIME</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISPLAY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CODE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SOFT-ISSUES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DEFAULT VALUES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADJUST mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONFIGURATION FACTORY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONFIGURATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAINS FREQ.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>REFERENCE FREQ.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BLACK FREQ.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LANGUAGE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONCENTRATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CODE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CALIBRATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRAB SAMPLE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SYSTEM ALARM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WARNING ALARM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAINS FREQ.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>REFERENCE FREQ.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BLACK FREQ.</td>
<td></td>
</tr>
</tbody>
</table>
```
User Interface

The interface consists of 5 keys and a graphic backlet display screen providing a display of the data, operational settings and trend curves.

Informations are available from several screens.

Main display

1. Name of last measured sample (here: sample 1)
2. Current time (XX:XX).
3. Concentration of last measured sample.
4. Unit concentration.
5. Sample is being analysed: SAMPLE 5. Analysis status: sampling, conditioning, measure … Bargraph indicates the state of the cycle.
6. Last slope and offset calibrations, date & time.
7. Function key
   - ESC: cancels a data input or goes back to the previous screen
   - Enter: validate and go to the next step
   - : function keys
8. Programming mode.
9. Go to display 2.
10. Start / stop the analyser.

Note:

It is possible to change the programming parameters when the Silkostat is analysing except menus which are protected by a code.
Definition of the display screen 2 (Disp2)

Last measures with next indications:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Sample name.</td>
</tr>
<tr>
<td>②</td>
<td>The last concentration value of the sample.</td>
</tr>
<tr>
<td>③</td>
<td>Time when last measurement was performed</td>
</tr>
<tr>
<td>④</td>
<td>Function key Disp3 (alarms) allows to access to the display 3.</td>
</tr>
</tbody>
</table>
Definition of the display screen 3 (Disp3) : alarms

This screen displays the alarms status as well as the following indications:

- **S1...S6**: Threshold function with the following parameters,
  - OK: Alarm condition is not met.
  - Sample X > XXX: Alarm is activated and the alarm condition is clearly mentioned. For example, the sample X measurement exceeds xxx ppb.
  - Disable: Alarm function is deactivated.
- **W**: Warning alarm.
- ****: System alarm.
- **DISP4**: Go to the display 4.

The following table indicates the different messages which may appear in case of default.

<table>
<thead>
<tr>
<th>Displayed message (english)</th>
<th>Description</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset mod. Measure</td>
<td>Reset of the measure module</td>
<td>System</td>
</tr>
<tr>
<td>Reset module LC</td>
<td>Reset of the local controller module.</td>
<td>System</td>
</tr>
<tr>
<td>Error lc</td>
<td>Local controller module error</td>
<td>System</td>
</tr>
<tr>
<td>Err. measure mod.</td>
<td>Measure module error</td>
<td>System</td>
</tr>
<tr>
<td>Com error</td>
<td>CAN communication error</td>
<td>System</td>
</tr>
<tr>
<td>Table error</td>
<td>Error during table transmission</td>
<td>System</td>
</tr>
<tr>
<td>Task error</td>
<td>Task execution error</td>
<td>System</td>
</tr>
<tr>
<td>Measure error</td>
<td>Measurement error</td>
<td>Warning</td>
</tr>
<tr>
<td>Reference error</td>
<td>LED light adjustment problem</td>
<td>Warning</td>
</tr>
<tr>
<td>Extinction error</td>
<td>Black current problem</td>
<td>Warning</td>
</tr>
<tr>
<td>Meas.time over</td>
<td>Maximum cycle time for the measure has been exceeded</td>
<td>Warning</td>
</tr>
<tr>
<td>Cal.time over</td>
<td>Maximum cycle time for calibration has been exceeded</td>
<td>Warning</td>
</tr>
<tr>
<td>No sample</td>
<td>No sample available</td>
<td>System</td>
</tr>
<tr>
<td>Sample x missing</td>
<td>Sample x missing</td>
<td>Warning</td>
</tr>
<tr>
<td>Reagent &lt; 250 ml</td>
<td>Low level of the reagent left (2.5 days before no reagent alarm)</td>
<td>Warning</td>
</tr>
<tr>
<td>Calib &lt; 300 ml</td>
<td>Low level of the calibration solution (1 calibration left before no calibration solution alarm)</td>
<td>Warning</td>
</tr>
<tr>
<td>No reagent</td>
<td>Empty reagent canisters &lt;150 ml</td>
<td>System</td>
</tr>
<tr>
<td>No calib</td>
<td>Empty calibration solution canisters &lt; 150 ml</td>
<td>Warning</td>
</tr>
<tr>
<td>Slope drift</td>
<td>Slight drift of slope calibration parameter (Confirmation zone)</td>
<td>Warning</td>
</tr>
<tr>
<td>Zero drift</td>
<td>Slight drift of zero offset calibration parameter (Confirmation zone)</td>
<td>Warning</td>
</tr>
<tr>
<td>Zero error</td>
<td>Zero calibration major error</td>
<td>System</td>
</tr>
<tr>
<td>Slope error</td>
<td>Slope calibration major error</td>
<td>System</td>
</tr>
<tr>
<td>Sample x &lt; C</td>
<td>Sample concentration x is lower than C</td>
<td>Threshold</td>
</tr>
<tr>
<td>Sample x &lt; 0 ppb</td>
<td>Sample concentration x is negative</td>
<td>Warning</td>
</tr>
<tr>
<td>Sample x &gt; 1000 ppb ou &gt; 5000 ppb</td>
<td>Sample concentration over range</td>
<td>Warning</td>
</tr>
</tbody>
</table>
Definition of the display 4 (Disp 4): trend curve

This screen allows to display the trend curves.

1. Time scale between 0 and 24 hours.
2. Concentration scale equals to analogue output programmed scale.
3. Sample name.
4. Number of the associated output.
5. Date of the trend curve.

Function key:
- **Main**: Return to the main screen.
- **Graph+**: Visualisation of the 6 curves associated with the 6 analogue outputs.

Modification of a value

The highlighted digit may be modified with the key  Esc. Each digit can be modified by pressing ENTER. Repeat both operations for each digit.

On the first digit: possibility to display the sign "-".
On the others digits: possibility to display the sign ".".

Note:
If you do not use the keyboard for at least 10 minutes, the instrument returns to the measuring mode except for the calibration and maintenance mode.

An access code may be required for the calibration, programming and service menu (see CODE menu).
You have 2 possibilities to access to the programming menu:

- Access to the menus which are not protected by a code:
  Simply press "MENU".

- Access to the menus which are protected by a code:
  Press "STOP" key.
  Confirm by "YES" key.
  Press "MENU"

Once the programming operation is completed and if the analyser is stopped, press "START" to restart it.
To get a good precision from the instrument, you should calibrate it on a regular basis.

Calibrations allow to adjust:

- ZERO of the system.
- SLOPE of the system.
- Both ZERO and SLOPE of the system.

The ZERO calibration is performed by the SILKOSTAT/chemically.

The slope of the system is calibrated with a known concentration of SiO\textsubscript{2} standard solution.

Three types of calibration are available:

- Primary calibration.
- Manual execution.
- Automatic execution.
A primary calibration is carried out when operating the instrument for the first time and is used as a reference for the following calibrations. Generally, it should be carried out only after a consequent modification.

It allows to fix the zero and slope reference.

All the results of the further manual or automatic calibrations will be compared to the zero and slope references set by this calibration.

A more important shift will allow to detect an error calibration which will be signified by an error message.

This calibration can be realized only in the manual way.

- Access to the main "MENU".
- Choose "CALIBRATION" menu with the "select" function key and validate by pressing "Enter".
- Choose "EXECUTION PRIMARY" sub menu and validate by pressing "Enter".

The slope calibration is going on, followed by the zero.

The upper bar indicates the type of calibration: primary, manual or automatic.

Press "Esc" if you want to quit the calibration menu: and go back to the "CALIBRATION" menu.

The calibration stages are displayed as follow:

- Sample preparation.
- Conditioning
- Measure.
- Rinse.

A bargraph indicates the calibration state.

At the end of the calibration, results are displayed on screen.
Primary calibration results:

\[ p = \text{value of the slope (ppb / Abs)} \]
\[ z = \text{value of the zero shift in milli-Abs} \]

The default values give an idea of the typical value.

Choice of the calibration.

**Access to the menu:**

- Press "MENU" key.
- Choose "CALIBRATION" menu with the "select" function key and validate by pressing "Enter".
- Choose "EXECUTION MANUAL CAL" with the "select" function key and validate by pressing "Enter".

This screen allows a manual calibration of the SILKOSTAT 9210.

Press "select" key.

Choose "EXECUTION SLOPE" or "EXECUTION ZERO" sub-menu and validate by pressing "Enter" key.
The calibration of the zero and the slope can be carried out automatically at adjustable frequencies.

- Press "CALIBRATION" menu.
- Sub-menu "PROGRAMMING" and validate by pressing "Enter".
- Choose "PROGRAMMING" sub-menu and validate by pressing "Enter".

This screen allows to program the zero calibration frequency, the calibration concentration solution and to choose an automatic calibration or manual calibration. The following table indicates the zero calibration frequency controlled in terms of the minimum concentration of the samples.

<table>
<thead>
<tr>
<th>Sample minimum concentration</th>
<th>Zero frequency control</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5 ppb</td>
<td>24 hours</td>
</tr>
<tr>
<td>5 &lt; x &lt; 50 ppb</td>
<td>48 hours</td>
</tr>
<tr>
<td>&gt; 50 ppb</td>
<td>&gt; 72 hours</td>
</tr>
</tbody>
</table>
In case of an automatic slope calibration, this screen allows to adjust the frequency.

- When the "BASE" menu is selected, the "WEEK" menu allows to choose the calibration day(s).

Example: SMTWTFS, daily calibration.
SM*W*FS, calibration every day except Tuesday and Thursday.

"HOUR" menu allows to adjust the hour to start calibration.

When the hour base is chosen, the "INTERVAL" menu allows to adjust the periodicity of the calibration slope.

The required slope calibration frequency is about 1 week (168 hours).
Calibration parameters sub menu

This screen allows to visualize the primary calibration parameters and the last calibration parameters.

<table>
<thead>
<tr>
<th>MANUAL / AUTOMATIC CALIBRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default values :</td>
</tr>
<tr>
<td>S = 760.0</td>
</tr>
<tr>
<td>O = 0.00</td>
</tr>
<tr>
<td>Primary calibration :</td>
</tr>
<tr>
<td>S = 694.0 01/01/01</td>
</tr>
<tr>
<td>O = 0.00 01/01/01</td>
</tr>
<tr>
<td>Last calibration :</td>
</tr>
<tr>
<td>S = 694.0 01/01/01</td>
</tr>
<tr>
<td>O = 0.00 01/01/01</td>
</tr>
</tbody>
</table>

Calibration historic sub menu

This screen allows to visualize the calibrations historic with the following information :

- Date and hour.
- Type : manual or automatic.
- Slope (S) and offset (O).

<table>
<thead>
<tr>
<th>HISTORIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>31/08/00 auto</td>
</tr>
<tr>
<td>09:18:01 O = -5</td>
</tr>
<tr>
<td>19:28:51 O = -5</td>
</tr>
<tr>
<td>02/09/00 manu</td>
</tr>
<tr>
<td>10:01:55 O = -4</td>
</tr>
<tr>
<td>12/09/00 manu</td>
</tr>
<tr>
<td>15:01:55 O = -6</td>
</tr>
<tr>
<td>15:01:55 S = 561</td>
</tr>
</tbody>
</table>
Manual – automatic calibration results sub menu

At the end of a manual or automatic calibration, the analyser compares the results with the primary calibration master.

According to the calibration results, you can validate, restart or quit the calibration.

There are 3 zones:

<table>
<thead>
<tr>
<th>S : (%)</th>
<th>20 %</th>
<th>50 %</th>
<th>150 %</th>
<th>180 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rejection zone</td>
<td>Confirmation zone</td>
<td>Zone ok</td>
<td>Confirmation zone</td>
<td>Rejection zone</td>
</tr>
<tr>
<td>O : (ppb)</td>
<td>- 50</td>
<td>- 30</td>
<td>30</td>
<td>50</td>
</tr>
</tbody>
</table>

**Zone ok**

Normal variations around the reference values. The new parameters are considered.

In automatic mode, the analyser returns to its measurement cycle.

In manual mode, validate with OK and restart the instrument (START).
Confirmation zone

Abnormal gap compared to the reference. So it allows to have correct results and a warning is displayed. In automatic mode, the analyser returns to the measure mode with the previous parameters.

In manual calibration, you must confirm (Conf) or cancel (Annul) the new parameters.

Rejection zone

Parameters are abnormal. There is material problem or an important error like bad calibration solution preparation. (see diagnostic).

In automatic mode, the analyser stops and emits an alarm system.

In manual mode, you can cancel (turn to the measure with previous parameters) or restart a calibration.
Maintenance menu

This screen allows to choose the proposed maintenance help procedure:

- **Start up**
  - Starting procedure.

- **Reagents refill**
  - The procedure is applicable to each reagent refill.

- **Tubes cleaning**
  - In case of reagent tubings clogging.

- **Extended stop**
  - Allows to condition the instrument before an extended stop.

- **Pumps, Solenoid valves, relays, others**
  - Working test of this devices.

- **Logical inputs**
  - Logical inputs test.

**Note:**

*When one of the maintenance procedure is released, the analyser automatically stops*

*Don’t forget to restart the instrument when maintenance operations are realized.*

Start up sub menu

This screen allows to adjust the sample flows

Adjust the first sample flow with the help of the screws placed in the front panel of the face (see figure 3.4 item. 2) to have a perpetual overflowing in the top of the overflow vessel.

Press OK to go to the next sample.
This screen allows to start the reagent pump tubes.

Every reagent and calibration solution renewal, access this menu for.

This menu allows to choose between:

**ADJUST VOLUMES**: the 4 canisters volumes are displayed and can be modified.

**TUBES PRIMING**: start the priming / renewal procedure of the reagents in the tubes. "Esc" allows to return to the previous screen or to stop the procedure.

**CANISTERS FULL**: choose this option each time than canisters are full. The volumes of the 4 canisters are automatically programmed with 2 litres.

This menu allows to visualize the volumes of the reagent canisters and the calibration solution. You eventually can adjust these volumes. The «FULL CANISTERS » menu put these volumes to 2 litres.

The analyser controls the calibration solution and reagent consumption and emits alarm system according to the level of the canisters.

<table>
<thead>
<tr>
<th>Warning</th>
<th>Alarm system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reagents</td>
<td>&lt; 200ml</td>
</tr>
<tr>
<td>Cal solution</td>
<td>&lt; 300ml</td>
</tr>
</tbody>
</table>
Tubes priming

The tubes priming is going on; the reagent pumps and the calibration solution are running at the same time than the mixing motor and the drain.

At the end of the tubes priming you can quit the procedure by pressing "ESC".

Note:
It is recommended to calibrate the zero after each reagent refill.

Extended stop sub menu

This screen shows the procedure to follow in case of a long stop (1 or more than a week).

Provide 250 ml of demineralised water.

Press "OK" to start each stage of the procedure.

Follow the instructions and validate each stage with "OK".

At the end of the stop, restart the analyser with the help of the MAINTENANCE / START UP menu.
Tubes cleaning procedure in case of depositing.

Have ready a beaker containing 250ml of demineralised water and a second beaker containing 100ml of ammonia at 10% of normal commercial concentrations by volume, ie, approximately 3% v/v.

Press "OK" for the cleaning and press "Esc" to stop and come back to the previous screen.

Follow the instructions and validate by "OK".
**Measure / Photometer test sub menu**

With this menu, technicians can verify the good running order of the photometer.

The mixer is operating and the calibration valve is open.

**Displayed parameters**
- **Dark current**: black measure value.
- **Reference**: reference signal after LED current adjustment.
- **Led current**: current of the LED.
- **Measure**: Continuous photometric measure signal.
- **Absorbance**: Absorbance in milli-Abs.

**Function key**
- **Bck**: allows to begin the "black" measure.
- **Ref.**: allows to adjust the led current and to measure the reference voltage.
- **Mes**: starts the continuous photometric measure.

**Pumps-others sub menu**

This screen allows to test the good running order of the pumps, the mixer, the drain and the heater.

Utilize the "Select" key to control an element and press the "On" key to operate it or "Off" key to stop it.

The following table shows the nominal flowrates for each pump:

<table>
<thead>
<tr>
<th>Pump</th>
<th>Reagent</th>
<th>Flowrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump 01</td>
<td>Reagent 1</td>
<td>1.5 ml/mn</td>
</tr>
<tr>
<td>Pump 02</td>
<td>Reagent 2</td>
<td>1.5 ml/mn</td>
</tr>
<tr>
<td>Pump 03</td>
<td>Reagent 3</td>
<td>1.5 ml/mn</td>
</tr>
<tr>
<td>Pump 04</td>
<td>Cal. solution</td>
<td>10 l/h</td>
</tr>
</tbody>
</table>
SOLICOSTAT 9210

Solenoid valves sub menu

This screen allows to test the correct operating of the solenoid valves.

Utilize the "Select" key to select a valve and press the "On" key to operate it or "Off" key to stop it.

Press "Esc" to come back to the previous screen.

- Solenoid valves 01 to 06: sample solenoid valves (measuring channel 01 to 06).
- Solenoid valves 07: measure solenoid valves (sample transfer from overflow tank to measuring cell).

Relays sub menu

This screen allows to operate or to stop the relays.

Utilize the "Select" key to select a relay and press the "On" key to operate it or "Off" key to stop it.

Logical inputs sub menu

This screen displays the status of the logical inputs and allows to test the good running order of the inputs In1 to In12.

Status:
- 1: short circuited input
- *: open input
Measure Menu

This screen allows to accede to the measure parameters: the mode and the cycle of measure, the historic, the external sample measure (manual analysis) and the photometer parameters (ADC values).

The measure historic allows to visualize the data during 5 days.

Measuring mode sub menu

This screen allows to program the measuring mode.

If the interval cycle is selected, the analysis are made every 10 minutes.

INTERVAL : XXX mn, you must adjust the measuring cycle time.

Example : if 030 mn is displayed, the instrument does a measure every 30 minutes.

OR

If the « In loop » cycle is chosen, measures are made one after one without waiting time.
Grab sample sub menu

Allows to carry out the measure with a grab sample.
Before measuring, take 200 ml of the sample to analyse.
The analyser begins to rinse the measuring cell.

The analyser complains the sample to analyse:
- Remove the level probe of the overflow vessel (figure 3.1, item 2), refill with the sample in 3 or 4 times.
- Replace the probe.
- Press "Ok" to operate the measure.

To return to the programming, wait the end of the measure (display of the results and « terminate » message).
"Esc" key allows to stop the measure and comes back to the previous screen.

Historic sub menu

This screen allows to read the stored data (concentration and alarm values).
Programming

Allows to choose the date and the time when the historic will be displayed and the measure channels desired.

- CH : all or individually (1 to 6)
- ALARMS (yes or no) : display of the « system » and « warning » alarms.

Read

“READ” allows to read the historic.

Use the scroll up key to choose the data format.

Date : day/month/year.

Hour, sample n° (#n) and concentration or default.

ADC values sub menu

This screen displays the parameters of the photometer for the primary calibration, the last calibration and the last measurement.

The information stored in this menu must be utilized only at the end of the diagnostic in case of incorrect operation.
Alarms Menu

This screen allows to assign alarms and parameters to each relay.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODE</td>
<td>Allows to choose the type of relay: threshold (limit), active channel or level sample.</td>
</tr>
<tr>
<td>AFFEC</td>
<td>Allows to assign the alarm (1 to 6) to the measure channel of our choice.</td>
</tr>
<tr>
<td>LIMIT</td>
<td>Allows to adjust the limit value (ppb)</td>
</tr>
<tr>
<td>DIRECTION</td>
<td>Allows to adjust the relay direction interlocking</td>
</tr>
<tr>
<td>HYSTERESIS</td>
<td>Allows to adjust the hysteresis in %</td>
</tr>
<tr>
<td>RELAYS</td>
<td>Relay type</td>
</tr>
<tr>
<td></td>
<td>N.O : normally open</td>
</tr>
<tr>
<td></td>
<td>N.C : normally closed</td>
</tr>
</tbody>
</table>
If **MODE** = Limit (concentration threshold)

**Example:**
- Affects the alarm contact 1 to channel 2
- Adjust of the threshold value 100.0 ppb.
- Relay activating direction towards up (when C > 100 ppb).
- No hysteresis : 00 %.
- Relay type N.O. (normally open)

**OR**

If **MODE** = Active channel

The alarm N°X is activated when the sample N°X is analysing.

Choice N.O (normally open) or N.C (normally closed).

**OR**

If **MODE** = Level sample

The alarm N°X is activated when the sample N°X is absent.

Choice N.O (normally open) or N.C (normally closed).
Warning alarm sub menu

Allows to adjust the « WARNING » alarm parameters.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARM</td>
<td>Yes: Warning alarm in operating or not.</td>
</tr>
<tr>
<td></td>
<td>No:</td>
</tr>
<tr>
<td>ACCEPT</td>
<td>Manual: Press enter to accept the alarm (manual).</td>
</tr>
<tr>
<td></td>
<td>Auto: Automatic accept of the alarm (disappear when the alarm disappear).</td>
</tr>
<tr>
<td>RELAY</td>
<td>N.O: &quot;Normally Open&quot;</td>
</tr>
<tr>
<td></td>
<td>N.C: &quot; Normally Closed&quot;</td>
</tr>
</tbody>
</table>

System alarm sub menu

Allows to adjust the system alarm

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARM</td>
<td>Yes: Activates / Deactivates the warning</td>
</tr>
<tr>
<td></td>
<td>No:</td>
</tr>
<tr>
<td>RELAY</td>
<td>N.O: &quot; Normally Open&quot;</td>
</tr>
<tr>
<td></td>
<td>N.C: &quot; Normally Closed&quot;</td>
</tr>
</tbody>
</table>

NB:

The alarm system can only be acknowledged manually, either by holding down the <Enter> key or, remotely, by using the digital input, In 11, on the I/O card (see Section 3, figure 3.10).
The following table shows the different alarms:

- **Warning**: the analyser emits a warning at the display and on the warning relay.
- **System alarm**: the analyser locks the system alarm relay, displays a message and stops.

<table>
<thead>
<tr>
<th>Displayed message (english)</th>
<th>Description</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset mod. Measure</td>
<td>Reset of the measure module</td>
<td>System</td>
</tr>
<tr>
<td>Reset module LC</td>
<td>Reset of the local controller module</td>
<td>System</td>
</tr>
<tr>
<td>Error lc</td>
<td>Error of the local controller module</td>
<td>System</td>
</tr>
<tr>
<td>Err. measure mod.</td>
<td>Error of the measure module</td>
<td>System</td>
</tr>
<tr>
<td>Com error</td>
<td>Error CAN communication</td>
<td>System</td>
</tr>
<tr>
<td>Table error</td>
<td>Error during transmission the table</td>
<td>System</td>
</tr>
<tr>
<td>Error task</td>
<td>Error of the task execution</td>
<td>System</td>
</tr>
<tr>
<td>Measure error</td>
<td>Error of the measure</td>
<td>Warning</td>
</tr>
<tr>
<td>Reference error</td>
<td>Current del adaptation problem</td>
<td>Warning</td>
</tr>
<tr>
<td>Extinction error</td>
<td>Extinction del problem</td>
<td>Warning</td>
</tr>
<tr>
<td>Meas. time over</td>
<td>Cycle time of the measure is very long</td>
<td>Warning</td>
</tr>
<tr>
<td>Cal. time over</td>
<td>Cycle time of the calibration is very long</td>
<td>Warning</td>
</tr>
<tr>
<td>No sample</td>
<td>No sample here</td>
<td>System</td>
</tr>
<tr>
<td>Sample default x</td>
<td>Short sample x</td>
<td>Warning</td>
</tr>
<tr>
<td>Reagent &lt; 250 ml</td>
<td>Low level of the reagent</td>
<td>Warning</td>
</tr>
<tr>
<td>Calib &lt; 300 ml</td>
<td>Low level of the calibration solution</td>
<td>Warning</td>
</tr>
<tr>
<td>Short reagent</td>
<td>Empty reagent canisters &lt;150</td>
<td>System</td>
</tr>
<tr>
<td>Short calib</td>
<td>Empty calibration solution canisters &lt; 150ml</td>
<td>Warning</td>
</tr>
<tr>
<td>Slope drift</td>
<td>Confirmation zone</td>
<td>Warning</td>
</tr>
<tr>
<td>Zero drift</td>
<td>Confirmation zone</td>
<td>Warning</td>
</tr>
<tr>
<td>Zero default</td>
<td>Rejection zone for the zero calibration</td>
<td>System</td>
</tr>
<tr>
<td>Offset zero</td>
<td>Rejection zone for the slope</td>
<td>System</td>
</tr>
<tr>
<td>Sample x &lt; C</td>
<td>Sample concentration x is &lt; to threshold C</td>
<td>Warning</td>
</tr>
<tr>
<td>Sample x &lt; 0 ppb</td>
<td>Sample concentration x is negative</td>
<td>Warning</td>
</tr>
<tr>
<td>Sample x &gt; 1000 ppb or &gt; 5000 ppb</td>
<td>Sample concentration too high</td>
<td>Warning</td>
</tr>
</tbody>
</table>
mA outputs menu

This screen allows to access to the analogue outputs parameters.

<table>
<thead>
<tr>
<th>AFFECT</th>
<th>Allows to assign the output (1 to 6) to the channel desired.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIAL PROG</td>
<td>Allows to program 0/4-20mA outputs in special cases.</td>
</tr>
<tr>
<td>TEST</td>
<td>Allows to test the correct operating of the analogue outputs.</td>
</tr>
</tbody>
</table>

Outputs affect 1 to 6 sub menu

This screen allows to select an output and to display its parameters.
This screen displays the parameters of each 6 output.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFFECT</td>
<td>Choice of the measure channel. The concentration of this channel will be carried over the output X.</td>
</tr>
<tr>
<td>TYPE</td>
<td>0-20 mA or 4-20 mA, choice of the analogue output scale.</td>
</tr>
<tr>
<td>MODE</td>
<td>Linear or dual (see curve)</td>
</tr>
<tr>
<td>FIRST</td>
<td>First scale value.</td>
</tr>
<tr>
<td>MIDDLE</td>
<td>Middle scale value.</td>
</tr>
<tr>
<td>END</td>
<td>End scale value.</td>
</tr>
</tbody>
</table>

If the dual mode is chosen, you must program the concentration value corresponding to the middle of the scale.

The following curve indicates the result of the 4-20 current in terms of the scale programming type and the first, middle and end value of the scale.

Current
0..20mA/4..20mA

20 / 20 mA
12 / 10 mA
4 / 0 mA

First
Middle
End

Concentration
Special prog sub menu

This screen allows to program the status of the output n°7 during special events:

- Maintenance.
- Calibration.
- Grab sample analysis.
- System alarm.
- Warning alarm.

With the help of the CHOICE function, choose the event for which the output n°7 can be programmed.

Storage: The output n°7 is not modified.

OR

Preset: The analogue output n°7 is set to the programmed value in the VALUE parameter between 0 and 21 mA.

Note:

In case of system alarm, all the analogue outputs (1 to 7) are fixed to the preset value.

According to the programmed choice selected in the menu mA outputs / special prog / system alarm.

Test sub menu

Allows to test all the loops 0.20 and 4.20.

The scroll up key allows to adjust the current value generated by each output between 0 and 21 mA.

(See paragraph Service/mA adjustment).
Communication menu

This screen allows to adjust the communication parameters like RS 485 of the SILKOSTAT. The communication protocol is MODBUS-JBUS.

Utilize the scroll up key to change the selected digit and press the « Enter » key to validate and go to the next digit.

<table>
<thead>
<tr>
<th>N°</th>
<th>Monec number (0 … 33).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud</td>
<td>Transmission speed in bauds (300, 600 1 200, 2 400, 4 800, 9 600).</td>
</tr>
<tr>
<td>Parity</td>
<td>odd, even, no.</td>
</tr>
<tr>
<td>Stop bit:</td>
<td>1 or 2</td>
</tr>
<tr>
<td>Swap word</td>
<td>Allows to reverse the send order of the data.</td>
</tr>
</tbody>
</table>

Choice of the measure sequence menu

The "SEQUENCE" menu allows to run or stop the different measurement channels and to set up the analysis samples order.

Channel activation sub menu

The « CHANNEL ACTIVATION » allows to run or to stop the measurement channel.

Select : allows to choose the channel.

: allows to run / stop a channel

Enter : allows to validate a choice.
The "SEQUENCE" menu displays the configured sequence and allows to change it.

The sequence is set up on 12 steps.

Utilize the scroll up key to change the number of the channel as the channel number as possible.

The "Delete" key replaces the digit by the symbol ".". This symbol indicates the inhibition of the step in the sequence.

Press "Enter" to validate and go to the next digit.

Sequences examples:

1) 1 2 3 4 5 6 * * * * * *
   4 5 6 3 2 1 * * * * * *
   These two sequences allow to analyse samples (1 to 6) in different order.

2) 12 12 12 12 12 12
   or 12 ** ** ** ** **
   or 1* 2* ** ** ** **
   These 3 sequences are the very same and allow to analyse alternately the samples 1 and 2.
This screen gives access to the parameters of the 9210 SILKOSTAT hardware.

This screen allows to change the date and the time of the instrument.

This screen allows to change the programming language, the concentration unit and to customize the samples displays (you can name the samples).

Languages : choice of the message language

- French : F
- English : GB
- German : D
- Spanish : Sp
- Italian : I

The unit choice is ppb / ppm or µg / mg/l
Customize

Allows to choose the letter
"Enter" allows to validate this letter and go to the next character.

Note
To customize a sample you can utilize the character « a.....z » and the number « 0.....9 ».

Service / Code sub menu

This screen allows to put an access code.
0000 is not a code.

Soft issues sub menu

This screen displays the different software issues installed on the different electronic boards of the 9210 SILKOSTAT.
**Default / values sub menu**

This screen allows to load default values. (See appendix C).

*Note:*

*This operation will erase all the parameters (calibration, 4...20 mA scale, alarms, sequence,...), and the default values will be loaded and will erase the measurement values and the historic alarms.*

**Adjust mA sub menu**

Select the output with the “Select” key and validate by the “Enter” key to display the next screen.

Each 4...20 mA output can be individually calibrated on 2 points.

Connect a mill ammeter to the 1 to 8 outputs.

Utilize the “-” and “+” key to adjust the current value to 4 and 20 mA, validate (press “Enter”) and press “Esc” to come back to the previous screen.
Configuration sub menu

This screen allows to change the frequencies

MAINS FREG.: 50 Hz or 60 Hz (it depends on the country frequency).

REFERENCE FREQ.: Current frequency adjustment of the LED-level reading.

BLACK FREQ.: Current frequency measurement of the black-level reading.

Factory sub menu

Note:

Personal constructor menu. An access code is required to enter.

This menu allows to adjust the number of measurement channels, sample solenoid valves, pumps wait and time of measurement.
Solenoid valves

Adjustment of the opening time of the sample solenoid valves and calibration solution pump (Ton) and waiting after action (Toff).

Pumps

Ton: number of impulses.

Toff: waiting time.

Measure

Allows to adjust the measurement parameters, the waiting time before the measurement and the measurement duration.
6. Maintenance and exploitation

A periodical maintenance will allow to have a good running and an exact analysis. Verify the level of the calibration solution and the reagents and refill if it is necessary.

Reagent refills

The analyser monitors the reagents and calibration solution consumption. Messages are displayed when the canister levels are low.

<table>
<thead>
<tr>
<th>Messages</th>
<th>Signification</th>
<th>Relays on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reagent &lt; 200ml</td>
<td>Low reagent level (range &lt; 10 days)</td>
<td>Warning (Re 11)</td>
</tr>
<tr>
<td>Cal. Sol &lt; 300ml</td>
<td>Calibration low level (range &lt; 2 calibration)</td>
<td>Warning (Re 11)</td>
</tr>
<tr>
<td>Short reagent</td>
<td>Reagent canister volume &lt; 150ml</td>
<td>System (Re 12)</td>
</tr>
<tr>
<td>Short cal.</td>
<td>Calibration solution canister volume &lt; 150ml</td>
<td></td>
</tr>
</tbody>
</table>

It is necessary to program the new canister volume at each refill for a good detection of the short reagent.

- Stop the instrument “STOP”.
- Refill the reagent canisters.
- Press the “MENU” key.
- Choose the “MAINTENANCE” menu.
- Choose the “REAGENTS REFILL” menu.

**ADJUST VOLUMES**: the 4 canisters volumes are displayed and can be modified.

**TUBES PRIMING**: start the priming / renewal procedure of the reagents in the tubes. “Esc” allows to return to the previous screen or to stop the procedure.

**CANISTERS FULL**: choose this option each time than canisters are full. The volumes of the 4 canisters are automatically programmed with 2 litres.

- Choose CANISTERS FULL to program all the canisters volumes to 2 litres.
Note:

It is recommended to calibrate zero after each reagent refill.
Prolonged stopping

In case of an extended stop longer than 1 week, it is recommended to clean the tubes and the measuring cell.

Provide 250 ml of demineralised water.

Submerge the 3 tubes in the beaker and start the rinsing operation:

- Stop the instrument by pressing "STOP".
- Press the "MENU" key.
- Choose the "MAINTENANCE" menu.
- Choose the sub menu "EXTENDED STOP".

The measuring cell is empty.
Disconnect the instrument.
Replace the reagents tubes in their canisters.

**Note**: *Don’t reverse the tubes.*

In case of an extended stop over 6 weeks, you must throw the reagents and prepare another set for the restart.
Restarting after a prolonged stopping

- Connect the analyser to the main.
- Start the instrument by pressing "START".
- Press the "MENU" key.
- Choose the "MAINTENANCE" menu.
- Choose the sub menu "START UP".

MAINTENANCE / START UP

This screen allows to adjust the samples flow.
Set the flow-rate for the first sample using the adjusting screws on the front panel (see Figure 3.3, serial 4) in such a way that a constant overflow takes place over the top of the overflow vessel.

This screen allows to start the pumps tubes.
Tube cleaning

The procedure is the following:

- Rinse the tube with demineralised (distilled) water.
- Clean with a 10% ammonia solution.
- Rinse again the tube with demineralised water.

During these stages:

In special cases you must clean the reagents tubes. Follow the procedure to clean the tubes with demineralised water and a 10% ammonia solution (NH4-OH) and rinse with demineralised water. During the cleaning the sample runs into the cell with the mixer running.

TUBES CLEANING
Put pumps tubes in demineralised water
Accept with OK

TUBES CLEANING
Put pumps tubes in a NH4-OH solution
Accept with OK.

TUBES CLEANING
Put pumps tubes in demineralised water
Accept with OK.
# 7. Troubleshooting

Possible sources of the problem

The list gives you an idea to inspect different parts of the 9210 SILKOSTAT when it doesn’t normally run.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Problem No</th>
</tr>
</thead>
<tbody>
<tr>
<td>The system doesn’t run</td>
<td>Start / Stop Datalyt</td>
<td>1</td>
</tr>
<tr>
<td>The measure is not stable, too high or too low.</td>
<td>Cal, Tubes, Photometer, Valves, Pump</td>
<td>5, 3, 8, 4, 2</td>
</tr>
<tr>
<td>Wrong calibration</td>
<td>Pump, Tubes, Valves, Cal solution, Calibration program, Reagents, Photometer</td>
<td>2, 3, 4, 6, 7, 8</td>
</tr>
<tr>
<td>The photometer doesn’t run or doesn’t correctly measure.</td>
<td>Photometer</td>
<td>8</td>
</tr>
</tbody>
</table>
## Possible solutions

<table>
<thead>
<tr>
<th>Problem</th>
<th>Symptom</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. START / STOP</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
|                  | Analyser stopped | • System alarm : Rectify the problem according to the displayed message (see System Alarm Messages).  
                      • Start up the analyser (START key).                 |
|                  | Mains power cut off | • Connect the analyser to the mains power.  
                      • Verify the fuse.                              |
| **2. PUMP**      |                 |                                                                          |
|                  | Doesn’t run      | • Test the pump : in the MAINTENANCE / PUMP menu  
                      start pumps one after one and verify than their flow is about 1,5ml / mn.  
                      • Change the pump.                                |
|                  | Irregular        | • The analyser may have been stopped without tubes cleaning. Send water in the pump during its work.  
                      • Change the pump.                                  |
| **3. TUBES**     |                 |                                                                          |
|                  | Defective tube   | Change the tube                                                           |
|                  | Clogged tube     | Change the tube                                                           |
| **4. SOLENOID VALVES** |               |                                                                          |
|                  | Solenoid valves leak | Remove, test and clean.                                                  |
|                  | The solenoid valves can’t open | Sticked collar, must be clean.                                            |
|                  | The solenoid valves can’t close | Locked spring ; necessary cleaning.                                       |
| **5. CAL.**      |                 |                                                                          |
|                  | Dirty            | Disconnect the samples from the sample block.                            |
|                  | Diminution of the flow | Verify and adjust the flow (10 l/h), change the sample tube if it is clogged. |
### Problem | Symptom | Solution
--- | --- | ---
**6. CALIBRATION** | Wrong configuration of the calibration solution concentration | Reprogram the calibration solution concentration (SiO₂)
| Wrong concentration of the standard solution | Prepare a new standard solution.
| Wrong laboratory analysis of the calibration solution concentration | Verify the SiO₂ concentration of the laboratory calibration solution.
| Wrong chemicals products or olds or contaminated | Wrong purity ? New supplier ? Clean the reagents bottles.
**7. REAGENTS** | Reagents canisters connected in a wrong order. | Verify the flow of the circuit "MAINTENANCE/PUMPS-OTHERS" menu.
| Reagents tubes connected in a wrong order. | Verify the flow diagram
| Wrong concentration | Prepare a new reagents batch
| Wrong chemical products or old or contaminated | Wrong purity ? New supplier ?
| Wrong reagents proportional | Verify the good running order of the pumps.
**8. PHOTOMETER** | Wrong or irregular measure | • Verify the photometer "MAINTENANCE / PHOTOMETER TEST " . In this menu measurement values of reference and measurement during the last calibration of the measurement cycle appears. The typical values of these values are in the following table.
• Is there an error message ?

---

**Typical measurement values during calibration**

These values are given as an indication and are dependant on the ambient temperature. The real values may deviate from more than one volt without having an effect on the measurements.

<table>
<thead>
<tr>
<th>Calibration solution</th>
<th>Reference (mV)</th>
<th>Measure (mV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>107</td>
<td>3500</td>
<td>2515</td>
</tr>
<tr>
<td>214,9</td>
<td>3500</td>
<td>1754</td>
</tr>
<tr>
<td>267,4</td>
<td>3500</td>
<td>1472</td>
</tr>
<tr>
<td>534,8</td>
<td>3500</td>
<td>603</td>
</tr>
</tbody>
</table>
# Appendix A : Spare parts of the 9210 SILKOSTAT

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accessories / Options</strong> :</td>
<td></td>
</tr>
<tr>
<td>0.5 – 6 bar adaptation kit for six sample selection solenoid valves</td>
<td>09210=A=0100</td>
</tr>
<tr>
<td>9210 Instruction manual in English</td>
<td>621=192=010</td>
</tr>
<tr>
<td>9210 Instruction manual in French</td>
<td>621=092=010</td>
</tr>
<tr>
<td>9210 Instruction manual in German</td>
<td>621=292=010</td>
</tr>
<tr>
<td>9210 Instruction manual in Italian</td>
<td>621=492=010</td>
</tr>
<tr>
<td>9210 Instruction manual in Spanish</td>
<td>621=592=010</td>
</tr>
<tr>
<td><strong>Spare parts - Electronics</strong></td>
<td></td>
</tr>
<tr>
<td>User’s interface / Interface board</td>
<td>09200=A=5000</td>
</tr>
<tr>
<td>CPU board with display for Monec E9200</td>
<td>09200=A=1000</td>
</tr>
<tr>
<td>Power supply board for Monec E9200</td>
<td>09200=A=2000</td>
</tr>
<tr>
<td>RS485 board (MODBUS) + Manual</td>
<td>09125=A=0485</td>
</tr>
<tr>
<td>92XX Internal bus communication module</td>
<td>09200=A=5500</td>
</tr>
<tr>
<td>2 wires interconnection cable (per m)</td>
<td>370=302=034</td>
</tr>
<tr>
<td>4 wires interconnection cable (per m)</td>
<td>370=304=034</td>
</tr>
<tr>
<td>7 wires interconnection cable (per m)</td>
<td>370=307=034</td>
</tr>
<tr>
<td>820 nm measurement module</td>
<td>09210=A=1500</td>
</tr>
<tr>
<td><strong>Spare parts – Sampling</strong></td>
<td></td>
</tr>
<tr>
<td>4x6 mm PE tubing (per m)</td>
<td>151575.00006</td>
</tr>
<tr>
<td>Sampling solenoid valve, NPS 1.6 (0.2-2 bars)</td>
<td>689=118=016</td>
</tr>
<tr>
<td>Sampling solenoid valve, NPS 0.8 (0.5-6 bars)</td>
<td>689=118=008</td>
</tr>
<tr>
<td>O-ring, 4 x 1</td>
<td>356099.05040</td>
</tr>
<tr>
<td>Sampling flow-rate adjustment screw</td>
<td>09210=A=0105</td>
</tr>
<tr>
<td>Sample level sensor for 921 X</td>
<td>09210=A=0250</td>
</tr>
<tr>
<td>Viton O-ring 38 x 2 mm</td>
<td>356099.35380</td>
</tr>
<tr>
<td>Sampling solenoid valves (overflow vessel)</td>
<td>689=118=024</td>
</tr>
</tbody>
</table>
### Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spare parts – Photometric cell</strong></td>
<td></td>
</tr>
<tr>
<td>Connection board for 921 X mixer/heater</td>
<td>09210=A=1234</td>
</tr>
<tr>
<td>Complete mixer for 921X analysers</td>
<td>09210=A=0400</td>
</tr>
<tr>
<td>Teflon coated magnetic stirrer</td>
<td>226=003=013</td>
</tr>
<tr>
<td>Heating element</td>
<td>09097=C=0560</td>
</tr>
<tr>
<td>Pt100 temperature sensor</td>
<td>359000,40780</td>
</tr>
<tr>
<td>Fibre optics for 9210 Silkostat 0-1000 ppb</td>
<td>09210=A=0500</td>
</tr>
<tr>
<td>Mirror for 9210 Silkostat 0-1000 ppb</td>
<td>09210=C=0340</td>
</tr>
<tr>
<td>PG21 tap PA black</td>
<td>431=002=010</td>
</tr>
<tr>
<td>Spacer ring for 921X mirror</td>
<td>09210=C=0330</td>
</tr>
<tr>
<td>O-ring Viton 22x1 mm</td>
<td>356099,05220</td>
</tr>
<tr>
<td>Square cover for 921 X photometric cell</td>
<td>09210=C=0310</td>
</tr>
<tr>
<td><strong>Spare parts – Reagents and calibration</strong></td>
<td></td>
</tr>
<tr>
<td>9210 SILKOSTAT set of dry chemicals for 45 days operation</td>
<td>09210=C=7000</td>
</tr>
<tr>
<td>PTFE tubing 1.7x2 mm (per m)</td>
<td>151065,15099</td>
</tr>
<tr>
<td>Reagent pulse pump</td>
<td>695=114=001</td>
</tr>
<tr>
<td>Calibration / flush pump</td>
<td>695=004=004</td>
</tr>
<tr>
<td>2 litres PE cap</td>
<td>495=020=001</td>
</tr>
<tr>
<td>Strainer</td>
<td>359097,01500</td>
</tr>
<tr>
<td>Connection for PE tube, Ø 3 x 5</td>
<td>148644,05125</td>
</tr>
<tr>
<td>Connection for PTFE tube, Ø 1.7 x 2</td>
<td>589=010=015</td>
</tr>
</tbody>
</table>

**Caution:**

*The chemical products kit of the SILKOSTAT is compounded with all the reagents except the sulphuric acid for 6 weeks.*
Appendix B : Safety Precautions

HEALTH AND SAFETY INFORMATIONS
PRODUCT : OXALIC ACID

The health and safety information on oxalic acid is as follows :

Name :

OXALIC ACID
1. dihydrate Formula : 1. (COOH)₂₂H₂O
2. anhydrous Formula : 2. (COOH)₂₉.

CAS N°144-62-7

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MELTING POINT</td>
</tr>
<tr>
<td>1. 101 °C</td>
</tr>
<tr>
<td>2. 190 °C</td>
</tr>
<tr>
<td>SOLUBILITY IN WATER</td>
</tr>
<tr>
<td>About 14%</td>
</tr>
<tr>
<td>FIRE AND EXPLOSION HAZARD</td>
</tr>
<tr>
<td>Decomposition products include carbon monoxide (highly flammable and toxic) and carbon dioxide.</td>
</tr>
<tr>
<td>HEALTH HAZARD</td>
</tr>
<tr>
<td>Classification of risk – Harmful</td>
</tr>
<tr>
<td>Harmful in contact with skin</td>
</tr>
<tr>
<td>Harmful if swallowed</td>
</tr>
<tr>
<td>Harmful if inhaled</td>
</tr>
<tr>
<td>Minimum lethal dose (LD₅₀) = 275 mg/Kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAFETY PRECAUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EYES</td>
</tr>
<tr>
<td>Irrigate thoroughly with water ; obtain medical attention</td>
</tr>
<tr>
<td>LUNGS</td>
</tr>
<tr>
<td>Remove exposure, rest and keep arm ; obtain medical attention</td>
</tr>
<tr>
<td>INGESTION</td>
</tr>
<tr>
<td>Wash out thoroughly with water ; give plenty of water of drink ; obtain medical attention</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHEMICAL HAZARDS AND STABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>STABILITY</td>
</tr>
<tr>
<td>Stable</td>
</tr>
<tr>
<td>SPECIAL HAZARDS</td>
</tr>
<tr>
<td>Mixtures with sodium chlorite can explode on the addition of water.</td>
</tr>
<tr>
<td>WASTE DISPOSAL</td>
</tr>
<tr>
<td>Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an after burner and scrubber. Dispose in safe manner consistent with Local Authority chemical waste regulations. For guidelines on disposal consult the requirements of the Control of Pollution Act (1974) and the Control of Pollution (Special Wastes) Regulations (1980 S1 1709).</td>
</tr>
</tbody>
</table>
## PROTECTIVE MEASURES

<table>
<thead>
<tr>
<th>RESPIRATOR</th>
<th>Dust mask or positive pressure hood – if handling large quantities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLOVES</td>
<td>Rubber or plastic</td>
</tr>
<tr>
<td>EYE PROTECTION</td>
<td>Goggles</td>
</tr>
</tbody>
</table>

## SPILLAGE HANDLING

<table>
<thead>
<tr>
<th>SMALL SPILLAGE</th>
<th>Mop up with plenty of water and run to waste, diluting greatly with running water.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE SPILLAGE</td>
<td>Transfer to salvage canister and treat residue as for small spillage.</td>
</tr>
</tbody>
</table>

The information on this sheet is believed to be correct at the time of collation. The details should be reviewed periodically and should be checked for special uses.
HEALTH AND SAFETY INFORMATION
PRODUCT : SULPHURIC ACID (98%)

The health and safety information for sulphuric acid is as follows :

Name :
SULPHURIC ACID Formula : H₂SO₄
Hazard class : 8 UN N° : 1830
CAS N° 7664-93-9

PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MELTING POINT</td>
<td>10 °C</td>
</tr>
<tr>
<td>BOILING POINT</td>
<td>330°C</td>
</tr>
<tr>
<td>SPECIFIC GRAVITY</td>
<td>1,8</td>
</tr>
</tbody>
</table>

MISCIBLE WITH WATER
May evolve toxic fumes in a fire.

FIRE AND EXPLOSION HAZARD

HEALTH HAZARD
Classification of risk – Corrosive.
Causes severe burns to eyes and skin.
If indigested causes severe internal irritation and damage.
Dilute acid irritates the eyes and skin and can cause burns and dermatitis.
Minimum lethal dose, D50 = 2140 mg/Kg, par voie orale.
Occupational exposure standard, long term exposure limit (8 hours TWA) mg³ : Keep out of reach of children.

SAFETY PRECAUTIONS-FIRST AID

EYES
Irrigate immediately and thoroughly with plenty of water at least of 10 minutes. Obtain medical attention.

LUNGS
Remove from exposure, rest and keep warm, or if exposure has been great, obtain medical attention.

MOUTH
Wash out mouth thoroughly with water ; give plenty of water to drink ; obtain medical attention.

SKIN
Drench the skin thoroughly with water and give plenty of water to drink. Obtain medical attention.
CHEMICAL HAZARDS AND STABILITY

<table>
<thead>
<tr>
<th>Reacts vigorously with evolution of heat. Never add water to this product. Will react violently with the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Acetonitrile.</td>
</tr>
<tr>
<td>• Perchlorates.</td>
</tr>
<tr>
<td>• Nitro-organic compounds.</td>
</tr>
<tr>
<td>• Alkali metals.</td>
</tr>
<tr>
<td>• Potassium permanganate</td>
</tr>
<tr>
<td>• Metal halogenates.</td>
</tr>
<tr>
<td>Avoid contact with bases.</td>
</tr>
</tbody>
</table>

PROTECTIVE MEASURES

| Wear chemical-resistant gloves (nitrile), safety goggles or face shield and use fume cupboard. For large quantities use approved breathing apparatus, plastic apron and sleeves and wear boots. Ensure that safety shower and eye bath are available in the locality. |

SPILLAGE HANDLING

| Wear appropriate protective clothing. Cover the spillage with soda ash. If local regulations permit, cautiously add plenty of water and mop up while diluting with more water and run to waste. Wash site of spillage thoroughly with water. Otherwise cover with dry lime, sand or soda ash and place in covered canisters. Arrange removal by disposal company. Ventilate area and wash spill site with water after material removal is complete. If material has entered drains it may be necessary to inform the Local Authorities. |

WASTE DISPOSAL

| Dispose in safe manner consistent with Local Authority chemical waste regulation. For guidelines on disposal consult the requirements of the Control Pollution Act (1974) and the Control of Pollution (special wastes) Regulations (1980 SI 1709). |

The information on this sheet is believed to be correct at the time of collation. The details should be reviewed periodically and should be checked for special uses.
The health and safety information on this product is as follows:

**SODIUM HEXAFLUOROSILICATE**
(sodium fluorosilicate, disodium hexafluorosilicate disodique)

Formula: \( \text{Na}_2\text{SiF}_6 \)

Hazard class: 6.1 No. UN: 2674

**CAS N° 16893-85-9**

**PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>White granular powder</td>
<td>Density (20 °C) approx. 2.7 g cm(^{-3})</td>
</tr>
<tr>
<td>Density (20 °C) approx. 2.7 g cm(^{-3})</td>
<td>Slightly soluble in water (6g 1-1 to 20°C)</td>
</tr>
</tbody>
</table>

**FIRE AND EXPLOSION HAZARD**

- When heated to decomposition it may emit hydrogen fluoride.

**HEALTH HAZARD**

- Classification of risk – toxic.
- Avoid contact with skin.
- Avoid contact with eyes.
- Keep locked up.
- Keep out of reach of children.
- Toxic by ingestion and skin contact
- Toxic by inhalation
- Irritating to skin and eyes, may cause damage if exposure is prolonged.
- Occupational exposure standard, long term exposure limit (8h TWA) 2,5 mg m\(^{-3}\)

**SAFETY PRECAUTIONS – FIRST AID**

- If the casualty feels unwell, seek medical advice and show label where possible.

**EYES**

- Rinse immediately and thoroughly with water for at least 10 minutes. Obtain medical attention.

**LUNGS**

- Remove from exposure, rest and keep warm. In severe cases, or if exposure has been great obtain medical attention.

**MOUTH**

- Wash out mouth thoroughly with water and give plenty of water to drink. Obtain medical attention.

**SKIN**

- Wash skin thoroughly with water and give plenty of water to drink. Obtain medical attention.

**CHEMICAL HAZARD AND STABILITY**

- Contact with acids liberates toxic gas.
### PROTECTIVE MEASURES (as appropriate to quantity handled)

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESPIRATOR</td>
<td>Dust respirator.</td>
</tr>
<tr>
<td>VENTILATION</td>
<td>Extraction hood.</td>
</tr>
<tr>
<td>GLOVES</td>
<td>Rubber or plastic.</td>
</tr>
<tr>
<td>EYE PROTECTION</td>
<td>Goggles or face shield.</td>
</tr>
<tr>
<td>OTHERS MEASURES</td>
<td>Plastic apron, sleeves, boots – if handling large quantities.</td>
</tr>
</tbody>
</table>

### SPILLAGE HANDLING

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRECAUTIONS</td>
<td>Wear appropriate protective clothing. Mix with sand, transfer carefully to canister and arrange removal by disposal company. Wash site of spillage thoroughly with water and detergent. For large spillages liquids should be contained with sand or earth and both liquids and solids transferred to salvage canisters. Any residues should be treated as for small spillages. If material has entered surface drains it may be necessary to inform Local Authorities, including fire services flammable.</td>
</tr>
<tr>
<td>WASTE DISPOSAL</td>
<td>Dispose in safe manner consistent with Local Authorities or national chemical Waste Regulation. For guidelines for disposal in the UK consult the requirements of the Control of Pollution (special wastes) regulations (1980 SI 1709).</td>
</tr>
</tbody>
</table>

The information in this sheet is believed to be correct at the time of callation. The details should be reviewed periodically and should be checked for special uses.
HEALTH AND SAFETY INFORMATION

PRODUCT : FERROUS SULPHATE

The following Health and Safety data should be noted concerning ferrous sulphate:

Name :
Ferrous sulphate 1. Hexahydrate
2. Dodecahydrate

CAS N°   1. 7783-85-9
2. 7783-83-7

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAPE</td>
</tr>
<tr>
<td>COLOUR</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>SMELL</td>
</tr>
<tr>
<td>MELTING POINT</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>SOLUBILITY IN WATER</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>DENSITY</td>
</tr>
</tbody>
</table>

FIRE AND EXPLOSION HAZARD
Non flammable.
May give off dangerous fumes in the event of a nearby fire.
In the event of fire, the substance may form: Nitrogen oxides and sulphur oxides.

HEALTH HAZARD
Toxicity: Ingestion of a single 30g dose causes vomiting, severe diarrhoea with bleeding, a state of shock and coma, sometimes with convulsions, which may lead to death.
A smaller dose will cause a state of shock, pulmonary oedema and coma, sometimes fatal.
A delayed risk also exists of gastric necrosis and hepatic failure.
### SAFETY PRECAUTIONS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EYES – SKIN</strong></td>
<td>Rinse copiously with water. Remove any contaminated clothing.</td>
</tr>
<tr>
<td><strong>LUNGS</strong></td>
<td>Do not leave the patient exposed, make them breathe plenty of fresh air and seek medical attention.</td>
</tr>
<tr>
<td><strong>INGESTION</strong></td>
<td>Make them drink plenty of water and provoke vomiting. Seek medical advice.</td>
</tr>
</tbody>
</table>

### CHEMICALS HAZARDS AND STABILITY

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STABILITY</strong></td>
<td>Conditions to be avoided: Significant heating.</td>
</tr>
</tbody>
</table>
| **DANGEROUS BREAKDOWN PRODUCTS** | • Nitrous gas.  
|                    | • Ammonia.  
|                    | • Sulphur oxides.                                                 |

### PROTECTIVE MEASURES

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RESPIRATOR</strong></td>
<td>Dust mask or positive pressure hood – if handling large quantities.</td>
</tr>
<tr>
<td><strong>GLOVES</strong></td>
<td>Essential. Wear gloves resistant to chemical products, eg, nitrile rubber.</td>
</tr>
<tr>
<td><strong>EYE PROTECTION</strong></td>
<td>Goggles.</td>
</tr>
<tr>
<td><strong>OTHERS</strong></td>
<td>Wear protective clothing and work in a well-ventilated area. Remove all contaminated clothing. Wash hands thoroughly after working with the substance.</td>
</tr>
</tbody>
</table>

### WASTE DISPOSAL

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dispose in safe manner consistent with Local Authority or national chemical Waste Regulation. For guidelines for disposal in the UK consult the requirements of the Control of Pollution (special wastes) regulations (1980 SI 1709).</td>
</tr>
</tbody>
</table>

The information in this sheet is believed to be correct at the time of callation. The details should be reviewed periodically and should be checked for special uses.
HEALTH AND SAFETY INFORMATION

PRODUCT: SODIUM BISULPHATE

The following Health and Safety data should be noted concerning sodium bisulphate (also known as sodium hydrogen sulphate or sodium acid sulphate):

Name:
Sodium bisulphate \( \text{NaHSO}_4 \)

CAS N° 7681-38-1

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAPE</td>
<td>Solid (granules)</td>
</tr>
<tr>
<td>COLOUR</td>
<td>white</td>
</tr>
<tr>
<td>SMELL</td>
<td>Inodorous</td>
</tr>
</tbody>
</table>

| HEALTH HAZARD | Corrosive, irritant. Causes serious damage if in contact with the eyes. |

<table>
<thead>
<tr>
<th>PROTECTIVE MEASURE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EYES</td>
<td>In the event of contact with the eyes, rinse copiously with water for at least 15 minutes. Seek medical attention.</td>
</tr>
<tr>
<td>SKIN</td>
<td>In the event of contact with the skin, rinse copiously with water. Remove any contaminated clothing. Seek medical attention.</td>
</tr>
<tr>
<td>LUNGS</td>
<td>Do not leave the patient exposed, make them breathe plenty of fresh air and seek medical attention.</td>
</tr>
<tr>
<td>INGESTION</td>
<td>Make them drink plenty of water and provoke vomiting. Seek medical advice.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHEMICAL HAZARD AND STABILITY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>STABILITY</td>
<td>Stable.</td>
</tr>
<tr>
<td>DANGEROUS BREAKDOWN PRODUCTS</td>
<td>Sulphur oxides.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROTECTIVE MEASURE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RESPIRATOR</td>
<td>Wear a dust-resistant breathing mask or an over-pressure respirator.</td>
</tr>
<tr>
<td>GLOVES</td>
<td>Essential. Wear gloves resistant to chemical products, eg, nitrile rubber,</td>
</tr>
<tr>
<td>EYE PROTECTION</td>
<td>Protective safety goggles are essential.</td>
</tr>
</tbody>
</table>
**OTHERS**

- Wear protective clothing and work in a well-ventilated area.
- Remove all contaminated clothing. Wash hands thoroughly after working with the substance.

**WASTE DISPOSAL**

- Dispose in safe manner consistent with Local Authorities or national chemical Waste Regulation. For guidelines for disposal in the UK consult the requirements of the Control of Pollution (special wastes) regulations (1980 SI 1709).

The information in this sheet is believed to be correct at the time of callation. The details should be reviewed periodically and should be checked for special uses.
LITHIUM BATTERY SAFETY PRECAUTIONS

The lithium battery on the Datalyt Microprocessor p.c.b does not constitute a serious hazard providing the following instructions are observed:

NEVER:

- Attempt to recharge the battery.
- Crush, puncture, open or dismantle the battery.
- Store or operate equipment above the temperature specified.
- Short-circuit the battery.
- Dispose of the battery in a fire.
- Try to repair faults on the control p.c.b.

In the event of a p.c.b fault or battery leakage:

ALWAYS:

- Wear suitable protective clothing.
- Remove the equipment to a well ventilated area.
- Contact your local agent.
- Refer to Health and Safety Notes on Lithium batteries.
### Appendix C : Table of user’s configuration

<table>
<thead>
<tr>
<th>Order</th>
<th>Function</th>
<th>Default/Values</th>
<th>Possible values</th>
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### ALARMS / ALARM 5

- **Mode**: Limit / limit/active channel/level sample.
- **Affect**: Channel 5
- **Limit**: 1000 ppb
- **Direction**: Low / low/high
- **Hysteresis**: 0%
- **Relay**: N.O. / N.O./N.C.

### ALARMS / ALARM 6

- **Mode**: Limit / limit/active channel/level sample.
- **Affect**: Channel 6
- **Limit**: 1000 ppb
- **Direction**: Low / low/high
- **Hysteresis**: 0%
- **Relay**: N.O. / N.O./N.C.

### ALARMS / WARNING ALARM

- **Alarm**: Yes / yes/no
- **Accept**: Manual / Manual/automatic
- **Relay**: N.O. / N.O./N.C.

### ALARMS / SYSTEM ALARM

- **Alarm**: Yes
- **Accept**: Manuel / Manual/automatic
- **Relay**: N.O. / N.O./N.C.

### mA OUTPUTS / AFFECT / OUTPUT 1

- **Affect**: Channel 1
- **Type**: 0 - 20 mA
- **Mode**: Linear
- **Low**: 0 ppb
- **Middle**: 100 ppb
- **Up**: 1 ppm

### mA OUTPUTS / AFFECT / OUTPUT 2

- **Affect**: Channel 2
- **Type**: 0 - 20 mA
- **Mode**: Linear
- **Low**: 0 ppb
- **Middle**: 100 ppb
- **Up**: 1 ppm

### mA OUTPUTS / AFFECT / OUTPUT 3

- **Affect**: Channel 3
- **Type**: 0 - 20 mA
- **Mode**: Linear
- **Low**: 0 ppb
- **Middle**: 100 ppb
- **Up**: 1 ppm
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#### SEQUENCE / CHANNEL ACTIVATION

| Channel 1 | On | on / off |
| Channel 2 | On | on / off |
| Channel 3 | On | on / off |
| Channel 4 | On | on / off |
| Channel 5 | On | on / off |
| Channel 6 | On | on / off |

#### SEQUENCE / PROGRAMMING

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#### SERVICE / CONFIGURATION

| Mains freq. | 50 Hz |
| Reference freq. | 50/60 Hz |

#### SERVICE / FACTORY

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<tr>
<td>Measure time</td>
<td>Extended measure</td>
</tr>
<tr>
<td></td>
<td>10 s xx s</td>
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Appendix D : Pressure range change

The battery of the input solenoid valves works with pure water sample. The pressure range is about 0.2 to 2 bars. If the pressure is about 0.5 to 6 bars, it is required to change the solenoid valves collar (see figure 1 item 6). So a « High pressure » kit contains 6 collars (0.8 diameter) and a TORX key.

Figure 1 Mounting of the solenoid valves

1. Hold down screw of the solenoid valves
2. Order coil
3. Body fixing screw
4. Solenoid valves main part
5. Flow direction
6. Solenoid valves collar
7. Seal
8. Calibration steel block
9. Sample output
10. Undeceiver
To change the solenoid valves collar, proceed as follows:

- Unscrew the 2 superior screw (1) of the solenoid valves.
- Move the solenoid valves coil
- Unscrew the 2 screws (3) of the main part fixing (4).
- Move the collar (6) of the body (4).
- Change the 2 O-rings (7) of the collar (6).
- Replace the joints to the new collar.
- Put the collar in position on the steel block (8) in the good direction. Place the undeceiver (10) in the indicated position in terms of the cal output (9).
- Replace the main part (4) in position; mark NC (5) and sample output (9) must be placed in the same side.
- Re-screw the fixing screw (3).
- Replace the coil (2) and tighten with help of the 2 screws (1).