# INSTRUCTIONS

SILEX 11, 21 and 41

with conductivity meter

ST3

# INSTALLATION AND OPERATING INSTRUCTIONS

## SILEX 11, 21 AND 41

## WITH CONDUCTIVITY METER

## ST 3

## PREFACE

The instructions are made so that they can be followed section by section. It is recommended to follow the instructions carefully since any service calls due to faulty installation, plant start, operation or insufficient maintenance are not covered by our guarantee.

## LIST OF FIGURES

## PLANT DATA

| | | |
|---|---|---|
| Water temperature ..... | max. | 35°C |
| Inlet water pressure..... | max. | 6 bar |
| Pipe connection, to, from, and drain ..... | | DN 15/20 mm PVC |
| Connection between tank and operating unit ..... | | Plastic hose, ½" |
| Electrical connection ..... | | 1 x 230 VAC, 50 Hz |
| | transformed into | 12 VAC, 50 Hz |

**TABLE 1**

| SILEX module | Filling of ion exchangers litres | Standard flow "Q" litres/hour | *Basic capacity litres °GH | Transport weight of drained tank approx. kg |
|---|---|---|---|---|
| 11 | 12 | 240 | 12900 | 15 |
| 21 | 21 | 420 | 22700 | 24 |
| 41 | 41 | 840 | 43200 | 45 |

* The basic capacities are stated at a temperature of 10°C with conductivities under 5 µS/cm, approx. 60 % of the capacity is under 0.1 µS/cm. The capacity is increased by approx. 10 % with conductivities up to 20 µS/cm.

## GENERAL INFORMATION

### PLANT DESCRIPTION

A complete SILEX plant comprises a stainless steel tank and a conductivity meter that continuously indicates the conductivity of the demineralized water.

The SILEX tank contains cation and anion exchange resins with a certain demineralization capacity.

### ION EXCHANGE RESINS

When the mixed bed ion exchangers have been consumed they must be replaced by new exchangers. You can either order new ion exchangers from us in bags of 25 litres each or buy the mixed bed ion exchangers locally in your country.

**COMPLETE SILEX 11 PLANT, flow 240 litres/hour**

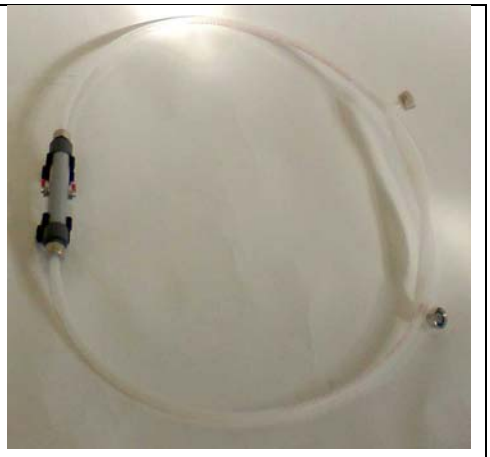
1 Silex 11 tank unit stainless steel tank (AISI 316Ti)
1 Conductivity Meter Type ST 3
1 Transformer 230/12 VAC
12 litres Ion exchange resins
(The tank unit is filled with ion exchange resins at the time of delivery)
1 Measuring cell ½”
3 1,2 m Plastic hose ½”

**COMPLETE SILEX 21 PLANT flow 420 litres/hour**

1 Silex 21 tank unit stainless steel tank (AISI 316Ti)
1 Conductivity Meter Type ST 3
1 Transformer 230/12 VAC
21 litres Ion exchange resins
(The tank unit is filled with ion exchange resins at the time of delivery)
1 Measuring cell ½”
3 1,2 m Plastic hose ½”

**COMPLETE SILEX 41 PLANT flow 840 litres/hour**

1 Silex 41 tank unit stainless steel tank (AISI 316Ti)
1 Conductivity Meter Type ST 3
1 Transformer 230/12 VAC
41 litres Ion exchange resins
(The tank unit is filled with ion exchange resins at the time of delivery)
1 Measuring cell ½”
3 1,2 m Plastic hose ½”



**QUALITY REQUIREMENTS OF THE UNTREATED WATER**

The temperature of the water to be demineralized **must not exceed 35°C and must not contain iron, manganese, oil, or large quantities of organic matter.** Common mains water will normally meet these requirements.

**THE CONTENTS OF DISSOLVED SALTS IN THE WATER - CONDUCTIVITY**

The electronic conductivity meter continuously indicates the conductivity of the demineralized water in µS/cm. The conductivity is a measure for the contents of dissolved solids in the water. The lower the conductivity, the smaller the contents of dissolved solids.

Examples:

| | | | |
|---|---|---|---|
| Distilled water | | 7-10 | µS/cm |
| Demineralized SILEX water | less than | 0.1 | µS/cm. |

**STORAGE OF A SILEX TANK**

On account of the ion exchange resins the SILEX tank unit must be stored in a frost-free room. An unused tank must be stored as cool as possible – best at refrigerator temperature i.e. 4-8°C. Storage at higher temperatures adds to the risk of growth of micro-organisms just like the tank's ability to produce water of low conductivity is reduced.

**LIFE**

Tanks that are stored at refrigerator temperature should be used within six months from the delivery date. When stored at room temperature the tanks should be used within three months. It is of greatest importance for the life of the tank units that they are stored and exchanged under so sterile conditions as possible so that the risk of contamination from the surroundings and the operator is minimized.

## INSTALLATION INSTRUCTIONS

**GENERAL INSTALLATION REQUIREMENTS**

1. The plant must be installed in a dry and frost-free room.

2. A suitable floor drain should be close to the plant.

3. If water hammering can occur, install a water hammer damper, for instance a diaphragm pressure expansion tank that is dimensioned according to the conditions.

4. If the water in the tank can be heated during standstill so that the pressure exceeds the allowable operating pressure of 6 bar, install a pressure release valve.

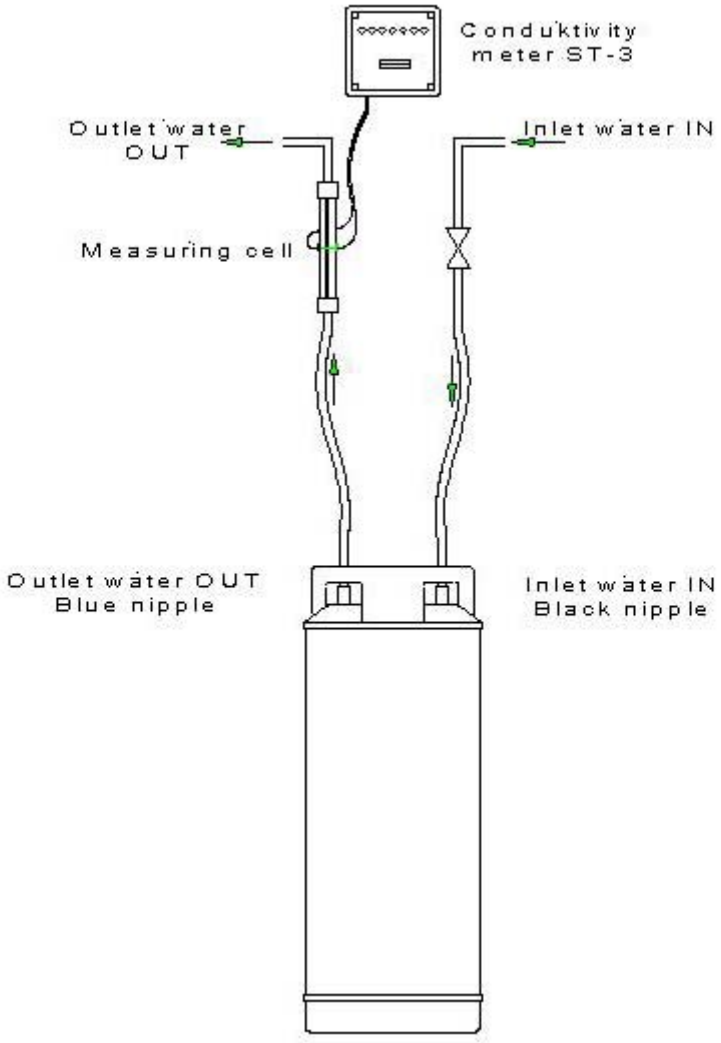
5. If the inlet water pressure can exceed the allowable operating pressure of 6 bar, provide a pressure reducing valve on the inlet of the plant.

6. **N.B.:** By use of an SILEX plant a small and limited discharge of very small particles of ion exchange media cannot be excluded. If such a discharge can harm the subsequent installation in any way, a suitable filter must be installed in the outlet line of the SILEX plant.

**INSTALLATION**

1. Place the tank at the installation site and connect with the hose couplings. From in front the inlet is to the left (black nipple) and the outlet to the right (blue nipple).

2. Connect the conductivity meter to 12 VAC 50 Hz via the supplied transformer, see the section "Conductivity Meter Type ST 3".



## CAPACITY CALCULATION

The volume of mains water that a tank can demineralize is calculated based on the basic capacity of the tank. The basic capacity is shown in Table 1.

The tank capacity is calculated by dividing the total salt content of the saline water converted into °GH into the basic capacity.

Example:
SILEX 21 has a basic capacity of 22,700 litres °GH.
The total salt content of the water corresponds to 20°GH.
Calculated capacity:

22,700 divided by 20 = 1,135 litres.

**N.B.:** If the plant is to polish demineralized water to obtain the lowest possible conductivity and silica content, the capacity must be calculated by one of our technicians.

**Calculation of total salt content of the inlet water, converted into °GH**

| **Cation load** | | **°GH.** | **Calculation °GH** |
|---|---|---|---|
| Calcium | $Ca^{2+}$ | mg/l x 0,140 = | |
| Magnesium | $Mg^{2+}$ | mg/l x 0,230 = | |
| Sodium | $Na^{+}$ | mg/l x 0,122 = | |
| Ammonium | $NH_4^{+}$ | mg/l x 0,156 = | |
| **Anion load** | | | |
| Chloride | $Cl^{-}$ | mg/l x 0,079 = | |
| Sulphate | $SO_4^{2-}$ | mg/l x 0,058 = | |
| Bicarbonate | $HCO_3^{-}$ | mg/l x 0,046 = | |
| Nitrate | $NO_3^{-}$ | mg/l x 0,045 = | |
| Silicic Acid | $SiO_3$ | mg/l x 0,047 = | |
| Uncombinex Carbonic Acid | $CO_2$ | mg/l x 0,064 = | |
| | | | |
| | | The total salt content – German degree °GH | |

| Total saltcontent equivalent °GH (German degree) | **SILEX 11** The actual capacity per unit / L | **SILEX 21** The actual capacity per unit / L | **SILEX 41** The actual capacity per unit / L |
|---|---|---|---|
| 4 °GH | 3225 | 5675 | 10800 |
| 5 °GH | 2580 | 4540 | 8640 |
| 6 °GH | 2150 | 3783 | 7200 |
| 7 °GH | 1843 | 3243 | 6171 |
| 8 °GH | 1612 | 2837 | 5400 |
| 9 °GH | 1433 | 2522 | 4800 |
| 10 °GH | 1290 | 2270 | 4320 |
| 11 °GH | 1173 | 2063 | 3927 |
| 12 °GH | 1075 | 1892 | 3600 |
| 13 °GH | 992 | 1746 | 3323 |
| 14 °GH | 921 | 1621 | 3086 |
| 15 °GH | 860 | 1513 | 2880 |
| 16 °GH | 806 | 1419 | 2700 |
| 17 °GH | 759 | 1335 | 2541 |
| 18 °GH | 717 | 1261 | 2400 |
| 19 °GH | 679 | 1195 | 2274 |
| 20 °GH | 645 | 1135 | 2160 |
| 21 °GH | 614 | 1081 | 2057 |
| 22 °GH | 586 | 1032 | 1964 |
| 23 °GH | 561 | 987 | 1878 |
| 24 °GH | 538 | 946 | 1800 |
| 25 °GH | 516 | 908 | 1728 |

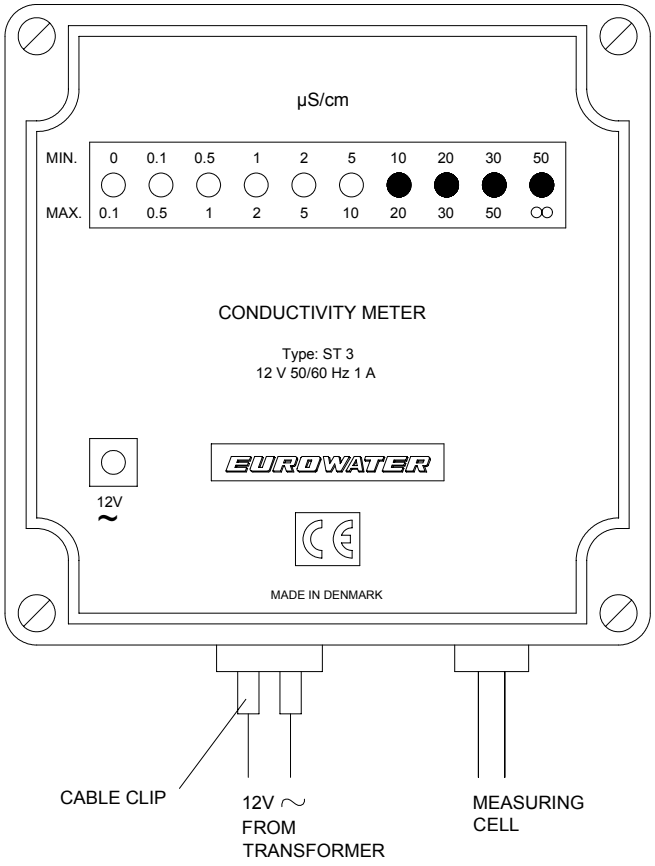



Fig. 3.

## CONDUCTIVITY METER TYPE ST 3

1. Connect the supplied transformer 230/12 VAC to the conductivity meter by means of the two red spade-shaped plugs. Plug the transformer into a 230 VAC wall socket. If the transformer wire shall be lengthened or shortened, use the supplied additional spade-shaped plugs.

2. Connect the wire with the two cable clips to each of the two terminals on the measuring cell. Shall the wire be lengthened or shortened, use the additional cable clips mounted on the measuring cell.

3. The meter is in operation when the green 12 VAC lamp is on. The conductivity of the water is continuously indicated by one of the ten light emitting diodes. A flashing of the diode every two seconds indicates a new measuring and the light stops at the light emitting diode for actual conductivity.

4. The scale indicates the min. and max. values of the conductivity. For instance if light emitting diode 4 from the left is on, the conductivity of the water is between 1 and 2 µS/cm.

5. At conductivities under 10 µS/cm the light emitting diodes are yellow. At conductivities over 10 µS/cm the light emitting diodes are red.