Depolox® 3 *plus*
RESIDUAL ANALYZER
FOR MEASURING CHLORINE, CHLORINE DIOXIDE, OZONE, AND/OR pH OR FLUORIDE

BOOK NO. WT.050.560.001.UA.IM.0607

BAE1077/Issue 01

EQUIPMENT SERIAL NO. _____

DATE OF START-UP _____

START-UP BY _____

Prompt service available from nationwide authorized service contractors.

ORDERING INFORMATION

In order for us to fill your order immediately and correctly, please order material by description and part number, as shown in this book. Also, please specify the serial number of the equipment on which the parts will be installed.

WARRANTY

Seller warrants for a period of one year after shipment that the equipment or material of its manufacture is free from defects in workmanship and materials. Corrosion or other decomposition by chemical action is specifically excluded as a defect covered hereunder, except this exclusion shall not apply to chlorination equipment. Seller does not warrant (a) damage caused by use of the items for purposes other than those for which they were designed, (b) damage caused by unauthorized attachments or modifications, (c) products subject to any abuse, misuse, negligence or accident, (d) products where parts not made, supplied, or approved by Seller are used and in the sole judgement of the Seller such use affects the products' performance, stability or reliability, and (e) products that have been altered or repaired in a manner in which, in the sole judgement of Seller, affects the products' performance, stability or reliability. **SELLER MAKES NO OTHER WARRANTY OF ANY KIND, AND THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS OF THE MATERIAL OR EQUIPMENT FOR ANY PARTICULAR PURPOSE EVEN IF THAT PURPOSE IS KNOWN TO SELLER.** If Buyer discovers a defect in material or workmanship, it must promptly notify Seller in writing; Seller reserves the right to require the return of such defective parts to Seller, transportation charges prepaid, to verify such defect before this warranty is applicable. In no event shall such notification be received by Seller later than 13 months after the date of shipment. No action for breach of warranty shall be brought more than 15 months after the date of shipment of the equipment or material.

LIMITATION OF BUYER'S REMEDIES. The **EXCLUSIVE REMEDY** for any breach of warranty is the replacement f.o.b. shipping point of the defective part or parts of the material or equipment. Any equipment or material repaired or replaced under warranty shall carry the balance of the original warranty period, or a minimum of three months. Seller shall not be liable for any liquidated, special, incidental or consequential damages, including without limitation, loss of profits, loss of savings or revenue, loss of use of the material or equipment or any associated material or equipment, the cost of substitute material or equipment, claims of third parties, damage to property, or goodwill, whether based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theory; provided, however, that such limitation shall not apply to claims for personal injury.

Statements and instructions set forth herein are based upon the best information and practices known to Siemens Water Technologies Corp., but it should not be assumed that every acceptable safety procedure is contained herein. Of necessity this company cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of hazards and it assumes no liability for accidents that may occur.

SIEMENS

Water Technolgies
1901 West Garden Road, Vineland, NJ 08360

INTRODUCTION

The Depolox® 3 *plus* Residual Analyzer is a low cost economical analyzer for potable water that continuously measures either free or total chlorine, chlorine dioxide or ozone residuals using proven amperometric measurement technology. There is also an arrangement available for measuring pH or flouride. All arrangements include a temperature measuring and monitoring device.

The Depolox® 3 *plus* analyzer consists of two separate components: a "wet side" package containing the sensor/cell and an electronic control package.

The electronic package is available for either 115 or 230 volt operation. A single input arrangement is used when only a disinfectant measurement (free or total chlorine, chlorine dioxide, ozone) is required. A dual input arrangement is available when either pH or fluoride measurement is required in addition to a disinfectant measurement. Note that for pH- or fluoride-only measurement, the dual input electronic package is required and the dual input cannot be used for two disinfectant measurements. All arrangements have temperature measurement. The electronic package provides for operator input via plain-text-assisted, self-explanatory menus and a sealed keypad. The large, two-line (16 characters each) display of disinfectant residual alternates every five seconds with the disinfectant value, temperature, and either pH or fluoride values when the analyzer is set up for these measurements.

There are two wetside configurations available: Membrane and Bare Electrode. Both consist of a flow-through cell with a transparent plexiglass body that houses one or two measuring sensors. The cell's transparency permits visual checks on the flow of sample water and measuring conditions. The Membrane wetside can be fitted with any one of four membrane-type sensors (free chlorine, total chlorine, chlorine dioxide or ozone) for disinfectant measurement. A second sensor can be added for pH or fluoride measurement. The bare electrode wetside is available for free chlorine measurement only. This arrangement can be used where a quick response time is required or if there is a high hardness in the sample water that could foul a membrane sensor. A second sensor can be added for pH or fluoride measurement. Note that free chlorine measurement by this wetside is affected by changes in pH. An optional CO_2 gas reagent kit is available for economical pH adjustment. It is also possible to compensate for pH changes by using a dual input arrangement with the pH sensor option for automatically calculating the residual value.

Refer to Table A for part numbers for the various analyzer combinations.

Table A - Analyzer Type Selection Sheet Using Package Numbers

ELECTRONIC PACKAGE (Select one)	PART #
Chlorine ONLY (SINGLE SENSOR)	
115V	AAD5680
230V	AAD5686
Chlorine AND/OR pH OR Fluoride (DUAL SENSOR)	
115V	AAD5683
230V	AAD5689
SENSOR 1 - DISINFECTANT (SINGLE OR DUAL) (Select one unless using pH or Fluoride alone)	
Depolox® 3 *plus* Bare Electrode (With PT100 Temperature Sensor)	
Free Chlorine Measurement Package (For Fluctuating pH, Dual Electronics with pH Kit Recommended)	AAB5383
OR	
Depolox® 5 Bare Electrode (With PT1000 Temperature Sensor)	
Free Chlorine Measurement Package (For Fluctuating pH, Dual Electronics with pH Kit Recommended)	AAC6208
OR	
Depolox® 3 *plus* Membrane Sensor	
Membrane Flow Block Assembly	AAB4390
OR	
VariaSens™	
Membrane Flow Block Assembly	AAD4165
AND (SELECT 1)	
Free Cl2 Probe FC1	AAC4297
Total Cl2 ProbeTC1	AAB1423
ClO2 Probe CD7	AAC4300
Ozone Probe OZ7	AAC4303
AND (SELECT 1)	
2m Cable	AAC4681
5m Cable	AAC4687
10m Cable	AAC4690
15m Cable	AAC4693
25m Cable	AAC5812
50m Cable	AAC5815

Table A - Analyzer Type Selection Sheet Using Package Numbers (Cont'd)

AND/OR (Options for Bare and Membrane)	
(For use with Depolox® 3 *plus* wetsides only)	
Flow Switch Alarm	AAA7000
Stop Valve	U95687
Note: Flow Switch and Stop Valve are integral to Depolox® 5 Bare Electrode and VariaSens™ Wet Side.	
SENSOR 2 (FOR DUAL INPUT ONLY)	
pH Kit (Compensation available if combined with Bare Electrode)	AAB5386
OR	
Fluoride Kit - Refillable	AAB5389
OR	
Fluoride Kit - Gel Type	AAC5570
AND (If Fluoride or pH ONLY)	
Fluoride/pH Standalone Wetside	U95224
Note: The standard 1 meter cable for the pH and fluoride probes is provided pre-attached to the dual electronics. No additional cable is required.	

Options:

- Flow switch (to provide alarm for loss of sample water)
  (Integral to Depolox® 5 bare electrode and VariaSens™ wetside)
- Stop valve (to shut off sample flow)
  (Integral to Depolox® 5 bare electrode and VariaSens™ wetside)
- Impedance transformer (for pH or Fluoride probe)

NOTE: When ordering material, always specify model and serial number of apparatus.

Electromagnetic Compatibility and Other Requirements

Depolox® 3 *plus* devices conform with the following requirements:

- Generic standards EN 50081-1 (emission)
- EN 55022 Class B
- EN 50082-2 (immunity)
- EN 61000 -4- 2, 3, 4, 5, 6, 8, 11

Depolox® 3 *plus* devices are designed for use in industry, as well as the domestic, business, and trade sectors.

Declaration of Conformity

Depolox® 3 *plus* devices comply with the requirements of the EU directives 89/392/EC "Machinery Directive", 73/23/EC "Low Voltage Directive" and 89/336/EC "Electromagnetic Compatibility" and the harmonized European Standards listed therein.

Intended Use

The Depolox® 3 *plus* consists of one or two combined measuring and reference sensors for chlorine, chlorine dioxide, ozone, temperature, pH, and fluoride; a measuring water monitoring device; and an electronics module. The system is for measuring the concentration of chlorine, chlorine dioxide, ozone and temperature as well as pH or fluoride, and to display and transmit measurements, in potable water.

Refer to the permissible measurement combinations, for a single unit, as mentioned previously.

WARNING: TO AVOID INJURY TO PERSONS CAUSED BY ELECTRICITY ONLY AUTHORIZED AND QUALIFIED ELECTRICIANS MAY INSTALL THE DEVICE AND OPEN THE HOUSING. THE DEVICE MAY ONLY BE OPERATED WHEN THE HOUSING IS CLOSED AND MUST BE CONNECTED TO THE PROTECTIVE CONDUCTOR. MODIFICATIONS TO THE DEVICE WHICH EXCEED THOSE DESCRIBED IN THIS MANUAL ARE NOT PERMISSIBLE.

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VERY IMPORTANT SAFETY PRECAUTIONS

This page provides very important safety information related to safety in installation, operation, and maintenance of this equipment.

WARNING

TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, OBSERVE THE FOLLOWING:

ALL USERS OF THIS EQUIPMENT SHOULD BE MADE AWARE OF THE PROBLEMS ASSOCIATED WITH HANDLING HAZARDOUS MATERIALS IN EITHER LIQUID OR GASEOUS FORM AND OF THE EFFECTS OF EXPOSURE TO THEIR FUMES. REFERENCE SHOULD BE MADE TO THE LITERATURE AVAILABLE FROM THE SUPPLIERS OF THESE CHEMICALS, PARTICULAR ATTENTION BEING PAID TO THE INFORMATION AND ADVICE ON PROTECTIVE CLOTHING.

THIS EQUIPMENT IS CONNECTED TO LINE VOLTAGE. IT IS ESSENTIAL THAT THE UTMOST CARE IS TAKEN WHEN WORK IS CARRIED OUT ON EQUIPMENT WHERE LINE VOLTAGES ARE PRESENT. IT IS RECOMMENDED THAT ALL POWER SUPPLIES ARE SWITCHED OFF WHENEVER POSSIBLE.

WHEN DEALING WITH HAZARDOUS MATERIAL, IT IS THE RESPONSIBILITY OF THE EQUIPMENT USER TO OBTAIN AND FOLLOW ALL SAFETY PRECAUTIONS RECOMMENDED BY THE MATERIAL MANUFACTURER.

DO NOT DISCARD THIS INSTRUCTION BOOK UPON COMPLETION OF INSTALLATION. INFORMATION PROVIDED IS ESSENTIAL TO PROPER AND SAFE OPERATION AND MAINTENANCE.

ADDITIONAL OR REPLACEMENT COPIES OF THIS BOOK ARE AVAILABLE FROM:

Siemens Water Technologies Corp.
1901 West Garden Road
Vineland, New Jersey 08360
Phone: (856) 507-9000
Fax: (856) 507-4125

VERY IMPORTANT SAFETY PRECAUTIONS (CONT'D)

NOTE

Minor part number changes may be incorporated into Wallace & Tiernan® (W&T) products from time to time that are not immediately reflected in the instruction book. If such a change apparently has been made in your equipment and does not appear to be reflected in your instruction book, contact your local W&T sales office for information.

Please include the equipment serial number in all correspondence. It is essential for effective communication and proper equipment identification.

REGIONAL OFFICES

INSTALLATION, OPERATION, MAINTENANCE, AND SERVICE INFORMATION

Direct any questions concerning this equipment that are not answered in the instruction book to the Reseller from whom the equipment was purchased. If the equipment was purchased directly from Siemens Water Technologies Corp., Vineland, NJ, contact the office indicated below.

UNITED STATES

1901 West Garden Road
Vineland, NJ 08360
TEL: (856) 507-9000
FAX: (856) 507-4125

CANADA

If the equipment was purchased directly from Siemens Water Technologies Canada, Inc., contact the nearest office indicated below.

ONTARIO

250 Royal Crest Court
Markham, Ontario
L3R3S1
(905) 944-2800

QUEBEC

243 Blvd. Brien
Bureau 210
Repentigny, Quebec
(450) 582-4266

MEXICO

If the equipment was purchased directly from Mexico, contact the office indicated below.

Via Jose López Portillo No. 321
Col. Sta. Ma. Cuautepec, Tultitlan
Edo. México 54900
TEL: +52 55 2159 2976 / +52 55 2159 2989
FAX: +52 55 2159 2985

SECTION 1 - TECHNICAL DATA

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PARA. NO.

1.1 Depolox® 3 *plus* Electronics

Power supply	115 V ± 10%, 50 - 60 Hz, 14 VA F1 Fuse T315 mA, 5 x 20 mm or 230 V ± 10%, 50 - 60 Hz, 14 VA F1 Fuse T160 mA, 5 x 20 mm
Input A: Disinfectant measuring ranges	Free and Total Chlorine 0.20 / 0.50 / 1.00 / 2.00 / 5.00 / 10.0 / 20.0 mg/l
Input A: Chlorine Dioxide ranges	0.20 / 0.50 / 1.00 / 2.00 / 5.00 / 10.0 / 20.0 mg/l
Input A: Ozone ranges	0.20 / 0.50 / 1.00 / 2.00 / 5.00 / 10.0 / 20.0 mg/l
Input A: Sample water temperature range	Depolox® 3 plus and Depolox® 5 Bare Electrode 41 to 122°F (5 to 50°C) Membrane Probes 41 to 113°F (5 to 45°C)
Input B: pH measuring ranges (Dual sensor)	pH 4.00 to pH 10.00, pH 0 to pH 14.00
Input B: Fluoride measuring range (Dual sensor)	0.20 to 2.00 mg/l
Measurement inputs	1 x disinfection sensor 1 x temperature 1 x pH or fluoride sensor (Dual Input only) electrically isolated for up to 50 V to ground
mA outputs 4 - 20 mA	1x for disinfection 1 x temperature 1x for pH or fluoride (with Dual Sensor) max. 1000 ohm load, electrically isolated for up to 50 V to ground
Relay outputs	2 freely configurable alarm contacts for disinfectant signal 2 for ph or fluoride (with Dual Sensor) Electrically isolated up to 500 V to ground

Relay Contact Rating	5A 1/6 HP 125, 250 V AC or 5A 30 V DC 30 W max. Interference suppression via suppressor diodes.
1x Digital input	Dry contact input Electrically non-isolated
Interface	RS485 for connection to programmable controller or central instrumentation and control systems via RS485 Siemens Water Technologies protocol.
Ambient operating temperature	32 to 122°F (0 to 50°C)

1.2 Sensor Feature List

	free C12 (bare electrode)	FC1 (membrane type)	TC1 (membrane type)
Principle of operation	Potentiostatic 3-electrode-amperometric, bare electrode	Potentiostatic 3-electrode-amperometric, membrane type	Potentiostatic 3-electrode-amperometric, membrane type
Measurand	free chlorine Cl	free chlorine Cl	total chlorine Cl
Application	Potable water, high hardness and fast response requirements	Potable water, prefered for low conductivity and variable pH	Potable water, prefered for low conductivity and variable pH
Range	0 to 20 ppm	0 to 20 ppm	0 to 20 ppm
Zero cal.	Required	Not required	Not required
Accuracy	0.01 mg/l or 2% F.S. whichever is greater	0.05 mg/l or 6% F.S. whichever is greater	0.05 mg/l or 6% F.S. whichever is greater
Sensitivity	0.01 mg/l or 1% F.S. whichever is greater	0.01 mg/l or 1 % F.S. whichever is greater	0.01 mg/l or 1% F.S. whichever is greater
Repeatability	0.01 mg/l or 2% F.S. whichever is greater	0.02 mg/l or 3% F.S. whichever is greater	0.02 mg/l or 3% F.S. whichever is greater
Stability	2% F.S. under typical conditions for 1 month	5% F.S. under typical conditions for 1 month	5% F.S. under typical conditions for 1 month
Response time (T_{90})	90% change in less than 20 seconds	90% change in less than 5 minutes	90% change in less than 5 minutes
Sample temp.	41 to 122° F (+5 to 50° C)	41 to 113° F (+5 to 45° C)	41 to 113° F (+5 to 45° C)
Storage temp.	14 to 140° F (-10 to 60° C)	14 to 122° F (-10 to +50° C)	14 to 122° F (-10 to +50° C)
pH dependence	pH 4 to pH 9 must have stable pH (max. pH variation 0.l pH); pH compensation available with dual input units.	Usable range pH 6 to pH 10; maximum interference 5% per pH unit.	Usable range pH 6 to pH 10; maximum interference 5% per pH unit.
Conductivity	> 250 µS/cm	>10 µS/cm up to 2500 µS/cm	> 10 µS/cm up to 2500 µS/cm
Sample water flow	33 1/h +/- 5 liter, constant	6 1/h to 35 1/h, constant	6 l/h to 35 1/h, constant
Inlet pressure	2 to 60 psi (0.15 to 4 bar)	2 to 60 psi (0.15 to 4 bar)	2 to 60 psi (0.15 to 4 bar)
Outlet pressure	0 psi	0 psi	0 psi
Temperature compensation	Yes, Pt 100 or Pt 1000 sensor	Yes, Pt 1000	Yes, Pt 1000
Flow switch (opt.)	Yes	Yes	Yes
Flow regulator	Yes	Yes	Yes
Reagents	None	None	None
Cleaning	Dynamic grit	None	None
Typical life time	membrane: 1 year electrolyte: 6 months	membrane: 1 year electrolyte: 6 months	membrane: 1 year electrolyte: 6 months

1.2 Sensor Feature List (Cont'd)

	CD7 (membrane type)	OZ7 (membrane type)
Principle of operation	Potentiostatic 2-electrode-amperometric-, membrane type	Potentiostatic 2-electrode-amperometric-, membrane type
Measurand	Chlorine Dioxide (ClO_2)	Ozone (O_3)
Application	All water with suspended solids less than 0.8 mm	All water with suspended solids less than 0.8 mm
Interference	Ozone and periacetic acid	Chlorine Dioxide and periacetic acid
Range	0 to 20 ppm	0 to 20 ppm
Zero cal.	Not required	Not required
Accuracy	0.05 mg/l or 6% F.S. whichever is greater	0.05 mg/l or 6% F.S. whichever is greater
Sensitivity	0.01 mg/l or 1 % F.S. whichever is greater	0.01 mg/l or 1 % F.S. whichever is greater
Repeatability	0.02 mg/l or 3% F.S. whichever is greater	0.02 mg/l or 3% F.S. whichever is greater
Stability	± 5% F.S. under typical conditions for 1 month	± 5% F.S. under typical conditions for 1 month
Response time (T90)	90% change in less than 20 seconds	90% change in less than 50 seconds
Sample temp.	41 to 113° F (+5 to 45° C)	41 to 113° F (+5 to 45° C)
Storage temp.	14 to 122° F (-10 to +50° C)	14 to 122° F (-10 to +50° C)
pH dependence	None	None
Conductivity	> 1 µS/cm up to 40 mS/cm	> 1 µS/cm up to 40 mS/cm
Sample water flow	6 l/h to 35 l/h, constant	6 l/h to 35 l/h, constant
Inlet pressure	2 to 60 psi (0.15 to 4 bar)	2 to 60 psi (0.15 to 4 bar)
Outlet pressure	0 psi	0 psi
Temperature compensation	Yes	Yes
Flow switch (opt.)	Yes	Yes
Flow regulator	Yes	Yes
Reagents	None	None
Cleaning	None	None
Typical life time	membrane: 1 year electrolyte: 6 month	membrane: 1 year electrolyte: 6 month

1.3 pH Sensor Kit (AAB5386)

Range	pH 0 to pH 14, pH 4 to pH 10
Temperature range	32 to 122° F (0 to 50° C) for the sample water
Pressure	max. 60 psig (4 bar)
Conductivity	>300µS/cm

NOTE: When used for pH compensated Free chlorine measurement, the pH range must be between 6 and 9. pH compensation available with Free chlorine bare electrode only.

NOTE: Where the standard 1.5-meter sensor cable is not long enough (for special installations up to 50-meter cable length), an impedance transformer is used to convert the very high-resistance electrode signal of the pH to a low-resistance signal. The impedance transformer (Part No. U95607) is screwed onto the pH sensor cable. The impedance transformer is powered by an integral battery. Battery lifetime is approximately five years.

1.4 Fluoride Sensor Kit (AAB5389)

Range	0.20 to 2.00 mg/L
pH Range	pH 5 to pH 8
Temperature Range	32 to 122° F (0 to 50° C)
Pressure	max. 60 psig (4 bar)
Conductivity	>300µS/cm

NOTE: An impedance transformer is used to convert the very high-resistance electrode signal of the fluoride sensor to a low-resistance signal. The impedance transformer (Part No. U95607) is screwed onto the fluoride sensor cable. It is powered by an integral battery. Battery lifetime is approximately five years.

SECTION 2 - INSTALLATION

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2.1 Depolox® 3 *plus*

NOTE: For safe and effective installation a knowledge of the connected devices is required with respect to operation, electrical connections, measurement signals, cable assignment, fuses and the safety regulations which have to be observed. The installation of the device therefore is only to be done by qualified and authorized skilled electricians.

CAUTION: Incorrectly connected devices may be damaged or destroyed when switching on or during operation, or may cause malfunctions in other devices. Be careful not to confuse measuring cables and other cables and not to let them come into contact with one another. Do not connect or disconnect live cables.

2.1.1 Unpacking

Check the transport packing for damage. Notify the carrier immediately if there is damage, otherwise your claim for compensation will be nullified.

If the device has suffered damage, get into touch with the responsible Siemens Water Technologies Corp. representative immediately. Keep the packaging until the system has been properly installed and is in operation.

2.1.2 Check Voltages

The line voltage of the Depolox® 3 *plus* is set at the factory in accordance with the instructions given at the time of the order (230 V or 115 V).

Check this setting from the rating plate immediately after unpacking the device, and in any case before it is installed.

If the line voltage setting does not match your supply, the setting will have to be altered (refer to paragraph 2.1.3, Adjust Line Voltage/Change the Fuse).

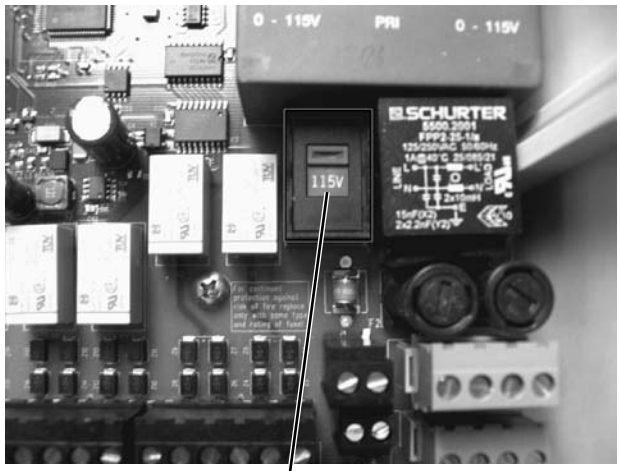
2.1.3 Adjust Line Voltage/Change Fuse

The rating plate on the top of the device shows the line voltage which was set at the factory. If this does not match the voltage at the site of installation, the device will have to be adjusted.

NOTE: Operating the device with the wrong voltage can lead to the device fuse blowing or other damage or malfunction. Adjustment of the line voltage must take place before installation and before the connection of cables. The device may be opened and adjusted by an electrician only.

For connection to power with two hot wires (L1, L2), replace the metal pin on the F2 socket by a fuse corresponding to the voltage (see Figure 2.1).

The switch to adjust the voltage is inside the housing. To open up the housing, unscrew the screws on each side of the cover and lift off the cover of the housing, being careful not to damage the ribbon cable. The cables must not be twisted. Unlock ribbon cable from circuit board and place cover aside.



The slide switch to adjust the voltage allows a choice between 230 V and 115 V.

Figure 2.1 - Rating Plate

2.1.4 Select Sensor Types

The setting for the measuring signal of the disinfection sensors must correspond to the connected sensor. Select the sensor at the ten-position DIP switch S3 on the board (factory setting is for Bare Electrode).

<u>WARNING</u>: DO NOT CHANGE SWITCH SETTINGS UNTIL UNIT IS DISCONNECTED FROM LINE POWER. CHANGING THE SWITCH SETTINGS WHILE THE UNIT IS POWERED UP WILL DAMAGE THE ELECTRONICS AND LOCK UP THE SYSTEM PROGRAM.

<u>WARNING</u>: WRONG SETTING CAN CAUSE DAMAGE TO THE SENSOR AND THE DEPOLOX® 3 *PLUS* ELECTRONICS.

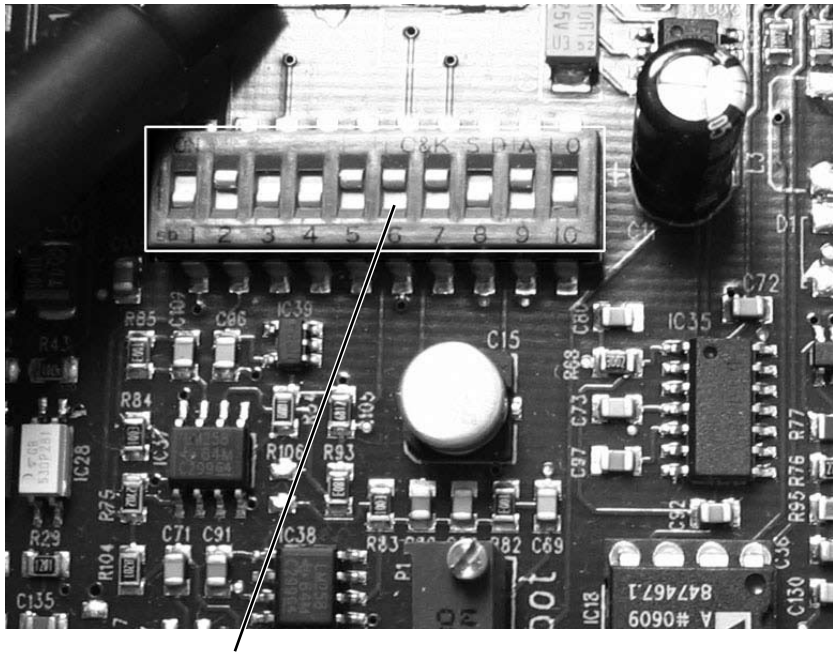
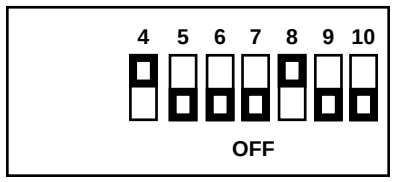


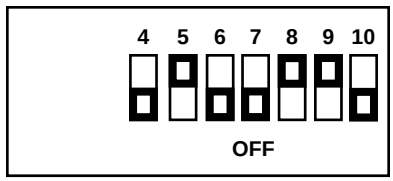
Figure 2.2 - DIP Switch

<u>NOTE</u>: Disconnect line power before changing DIP switch settings.

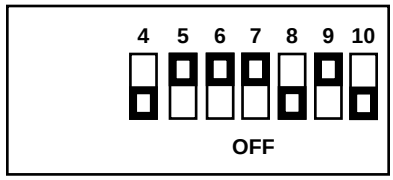
3-Elect. “Depolox® 3 *plus*”
(Bare Electrode):
(Default factory setting)



2-Elect. “old Depolox® 3”:

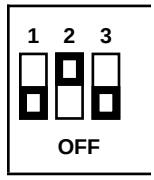


All membrane sensors:
(FC1, TC1, CD7, OZ7)

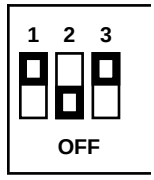


In case the cell current is >200µA (e.g., in waters with high conductivity), change the setting of positions 1 through 3 as follows:

DIP Switch (default 200µA):



DIP Switch
(only if sensor current >200µA to max. 1000 µA):



The other positions remain as before.

2.1.5 Installing the Depolox® 3 *plus* Electronics Module

The Depolox® 3 *plus* electronics module is built in a wall-mounted housing and should be mounted near the flow-through assembly.

2.1.6 Electrical Connections

Connect the sensor cables, alarm signal lines and the power cable according to the wiring diagrams (see Dwgs. 50.560.155.010, .020 and .050).

Do not switch on the power.

2.1.7 Digital Input

The flow switch (optional) must be connected to the digital input terminals 1-2 DI1, 3-4 DI2, 5-6 DI3.

The digital input "Digital IN" is set for a potentially isolated external contact, e.g., for the flow switch.

If the flow switch is not used, jumper unused terminals, otherwise, "Digital IN" error will occur.

2.1.8 Start-Up

WARNING: THE DEPOLOX® 3 *PLUS* MODULE HAS NO POWER SWITCH OF ITS OWN AND IS IN OPERATION AS SOON AS THERE IS A CONNECTION TO THE POWER SUPPLY. CONNECTED DEVICES HAVE TO BE SWITCHED OFF DURING INPUT OF OPERATING DATA IN ORDER TO PREVENT UNCONTROLLED START-UP OR MALFUNCTIONS. ONLY WHEN THE OPERATING DATA IS INPUT AND CHECKED MAY OTHER DEVICES BE SWITCHED ON.

Start-up can only be effected after correct installation of the sample water line, leak test, and electrical connection to the systems.

Start operation of the measuring cell (refer to paragraph 3.3.1, Start-Up of the Measuring Cell, or to paragraph 2.3, Membrane Sensors.

Check that the setting of the 10-position DIP switch, S3, "Chlorine Cell" (refer to paragraph 2.1.4, Select Sensor Type) is correct. Start by switching on the mains power to the control module.

First, the program version is displayed, for example:

EAE1053
FRG 49
V:X_XX/XX
Free Chlorine

Continue as follows (refer to Section 3 - Operation, as necessary):

a. Select measuring range in the SETUP menu.

b. Select pH Fluoride measuring range.

c. Select code definition.

d. Select hold function.

e. Select language.

f. Select the bus address in the SETUP menu (if operated in a bus system).

g. Select disinfectant.

h. Select pH or Fluoride mode (optional, SETUP).

i. Select temperature.

2.2 Bare Electrode (Free Chlorine) Sensor Kit

The flow block assembly with the sensors should be installed in a frost-protected location and, where possible, in a heated room.

The sample water should provide a minimum of approximately 2 psi (0.2 bar) water gauge pressure at the measuring cell inlet.

The sample water line should be as short as possible. In the water line to the measuring cell a strainer (size 0.5 mm) must be installed.

The sample water inlet must be connected to a stop valve (connection 1/4" - 18 NPT). The tapping point for the sample water must be positioned to ensure a bubble-free flow of water and a complete mixing of the disinfectant.

The drain line must be unpressurized.

2.3 Membrane Sensors (See Dwg. 50.560.160.020 in Section 3)

<u>WARNING</u>: DO NOT TOUCH THE REFERENCE ELECTRODE! DO NOT TOUCH THE MEMBRANE!

Before unscrewing the membrane cap, remove the elastomer seal to allow air into the vent hole. Not doing this will cause a vacuum to occur which will damage the membrane when unscrewing the cap. Do not remove the yellow-grey layer on the reference electrode.

Unscrew the membrane cap from the electrode shaft and fill it to the top with the enclosed electrolyte. Strike the electrode shaft against the membrane cap to remove air bubbles. Clean the gold working electrode with

the enclosed lapping paper (special abrasive paper). To do this, place the special abrasive paper on a paper towel. While holding on to a corner of the paper move the tip of the electrode of the vertically held probe one or two times over the rough side of the special abrasive paper. Ensure that the elastomer seal completely covers the vent hole. While holding the electrode shaft in a vertical position, screw on the cap onto the shaft. Surplus electrolyte will escape through the vent hole in the membrane cap below the elastomer seal. Do not hold the vent hole or press on the elastomer seal! If you detect air bubbles in the electrolyte, repeat the filling process. Wash away the escaped electrolyte with water.

NOTE: The membrane cap must be completely screwed to the electrode shaft so that no gap remains between membrane cap and electrode shaft. The sensor requires a one- to two-hour run in time before a first calibration can be performed. The final calibration should be done after one day.

2.3.1 Insert Membrane Sensor Into Flow Block Assembly

Position the sensor through the flow block cap such that the sensor body touches the bottom of the water inlet assembly. The water flow should point directly to the membrane. It may be necessary to turn the flow block cap to find the correct position for the sensor in the water inlet assembly. Remove any air bubbles from the membrane as they disturb the measurement. Connect the sensor cables to the electronic module.

Under these conditions the sensor should give proper readings for three to six months.

For connection to the Depolox® 3 *plus* electronics, refer to Dwgs. 50.560.155.020.

The sensor requires a one to two hour run in time before a first calibration can be performed. The final calibration should be done after one day.

2.4 pH Sensor Kit

NOTE: This kit is required for pH-compensated Free chlorine measurement when used with the Bare Electrode Cell.

To insert the pH sensor into the flow block assembly, remove the cap from the pH sensor, attach the impedance transformer (if required) to the top of the sensor, connect the cable to the impedance transformer (or probe if not used), and put the sensor into the smaller hole in the flow block assembly cover or standalone wetside.

The cable for the pH and Fluoride probe is pre-attached to the dual electronics unit. Connect cable end to probe. No additional wiring is required.

2.5 Fluoride Sensor Kit

To insert the fluoride sensor into the flow block assembly, prepare the sensor as described in paragraph 3.6.2, Preparation of the Electrode.

Connect the end of the sensor cable to the impedance transformer, attach the cable to the other side of impedance converter, add electrolyte to the sensor (if required), and place the sensor into the hole in the flow block assembly cover or standalone wetside.

The cable for the pH and Fluoride probe is pre-attached to the dual electronics unit. Connect cable end to probe. No additional wiring is required.

2.6 Flow Switch (AAA7000) (Optional) (Depolox® 3 *plus* Wet Side Only)

In general, the flow switch is only connected to the digital input of the Depolox® 3 *plus*. In case of other applications, ensure that the rating of this Reed contact (100 V AC and 0.5 A) is not exceeded even for a short time. In case inductive loads (e.g., relays or contactors) are switched, the contact has to be protected against induction sparks.

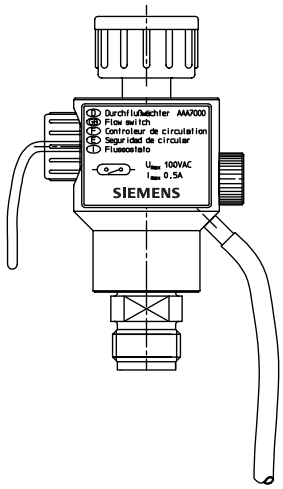


Figure 2.3 - Flow Switch

See Dwgs. 50.560.100.020 and .030 for flow switch location.

2.7 Stop Valve (U95687) (Optional) (Depolox® 3 *plus* Wet Side Only)

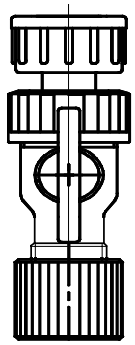
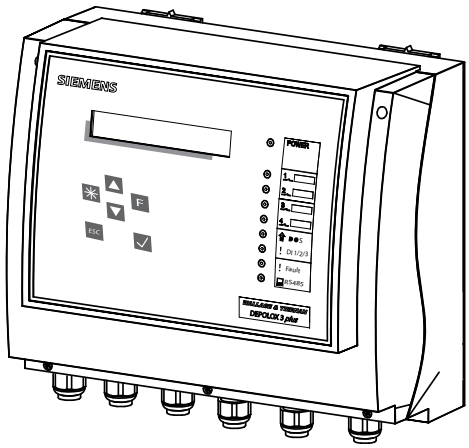
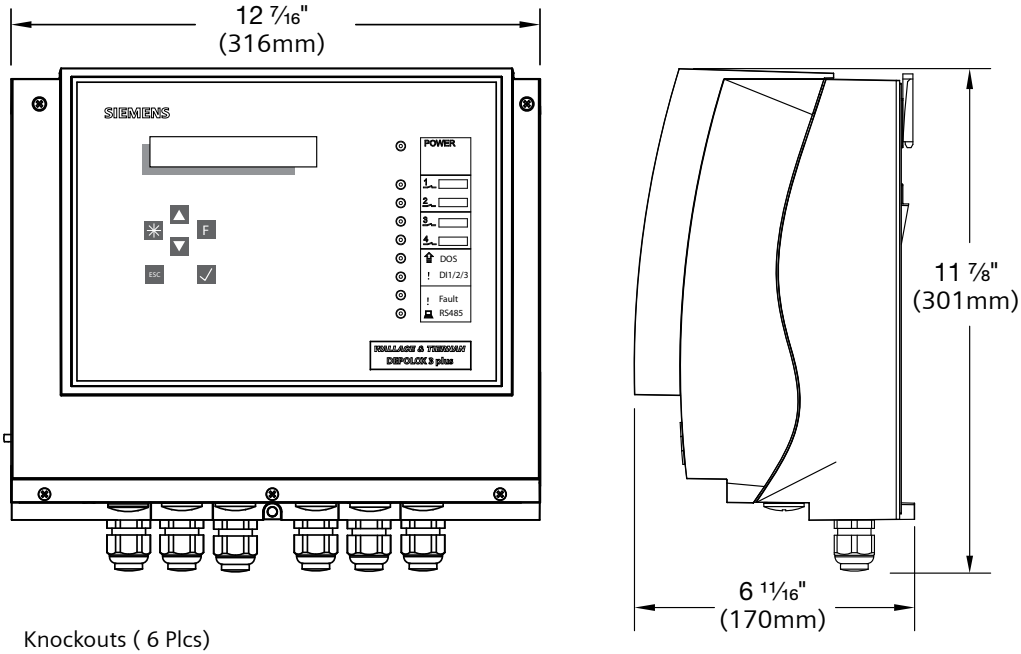
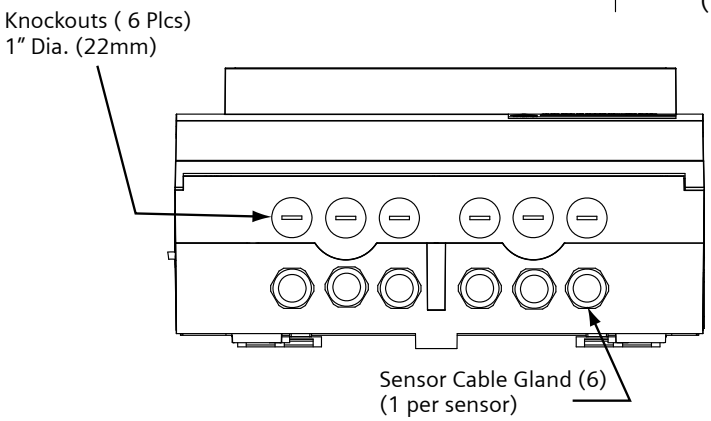


Figure 2.4 - Stop Valve

See Dwgs. 50.560.100.020 and .030 for stop valve location.



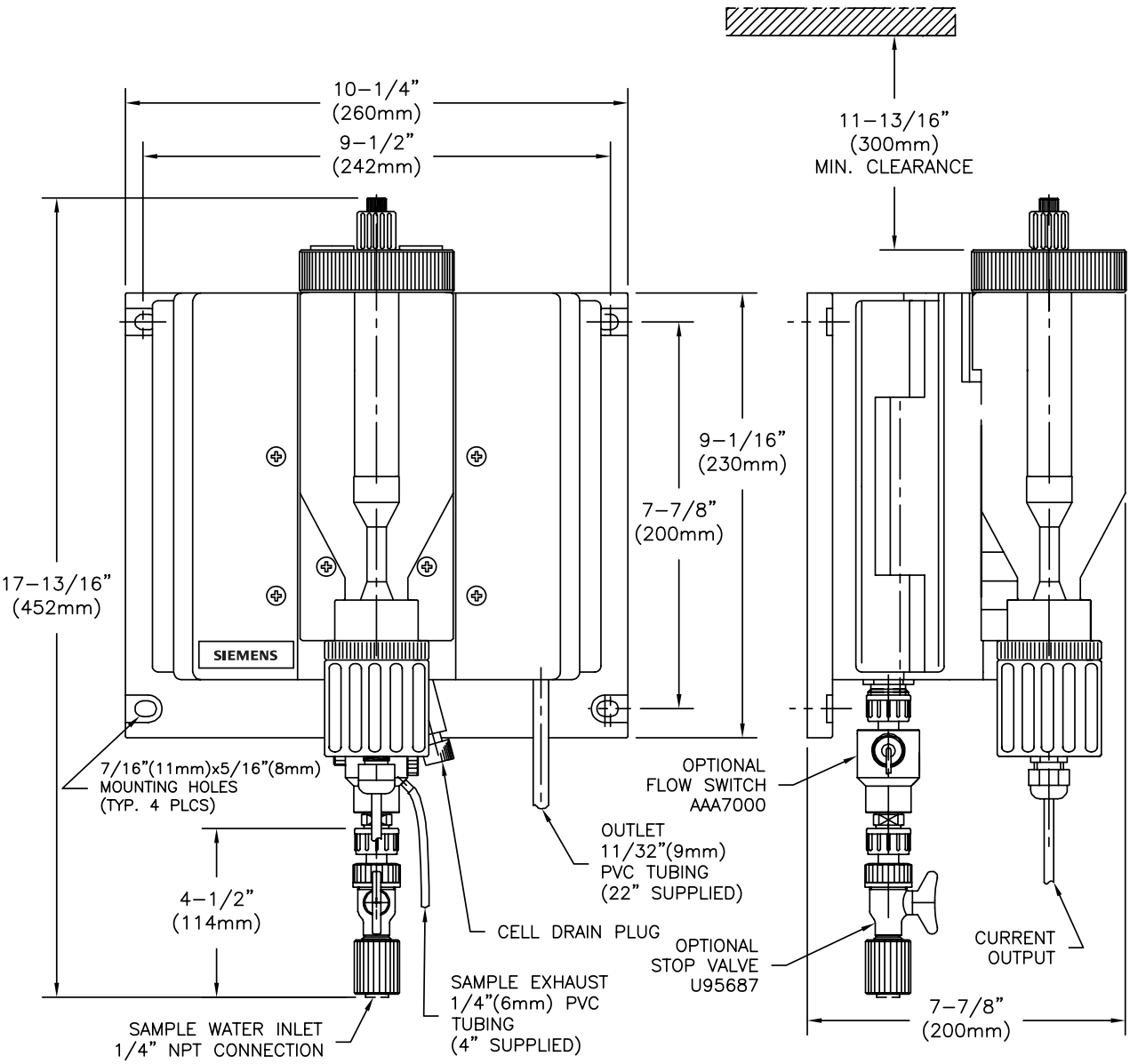




DEPOLOX® 3 *plus* ELECTRONIC MODULE - DIMENSIONS

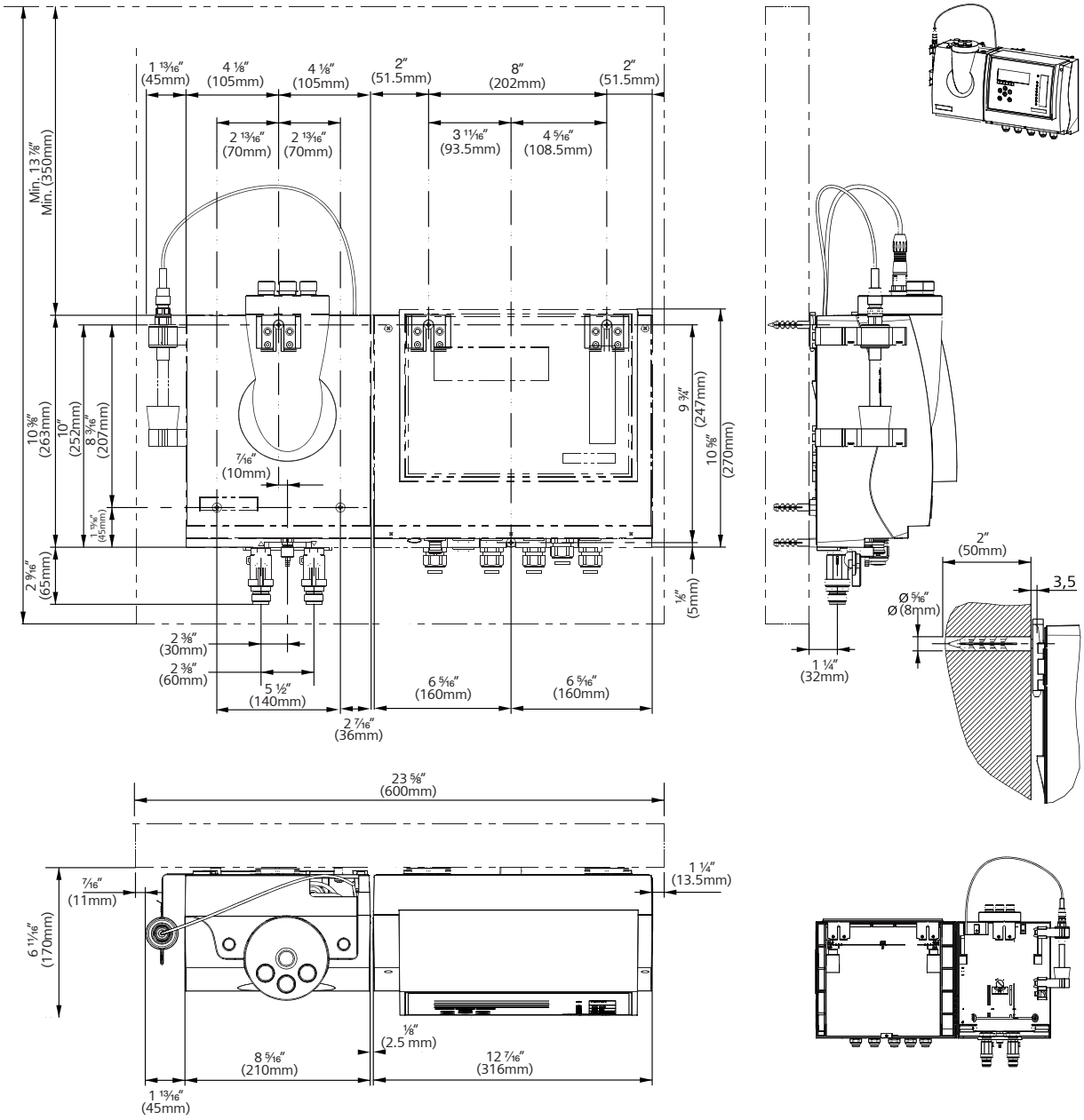
50.560.100.010

ISSUE 1 6-07



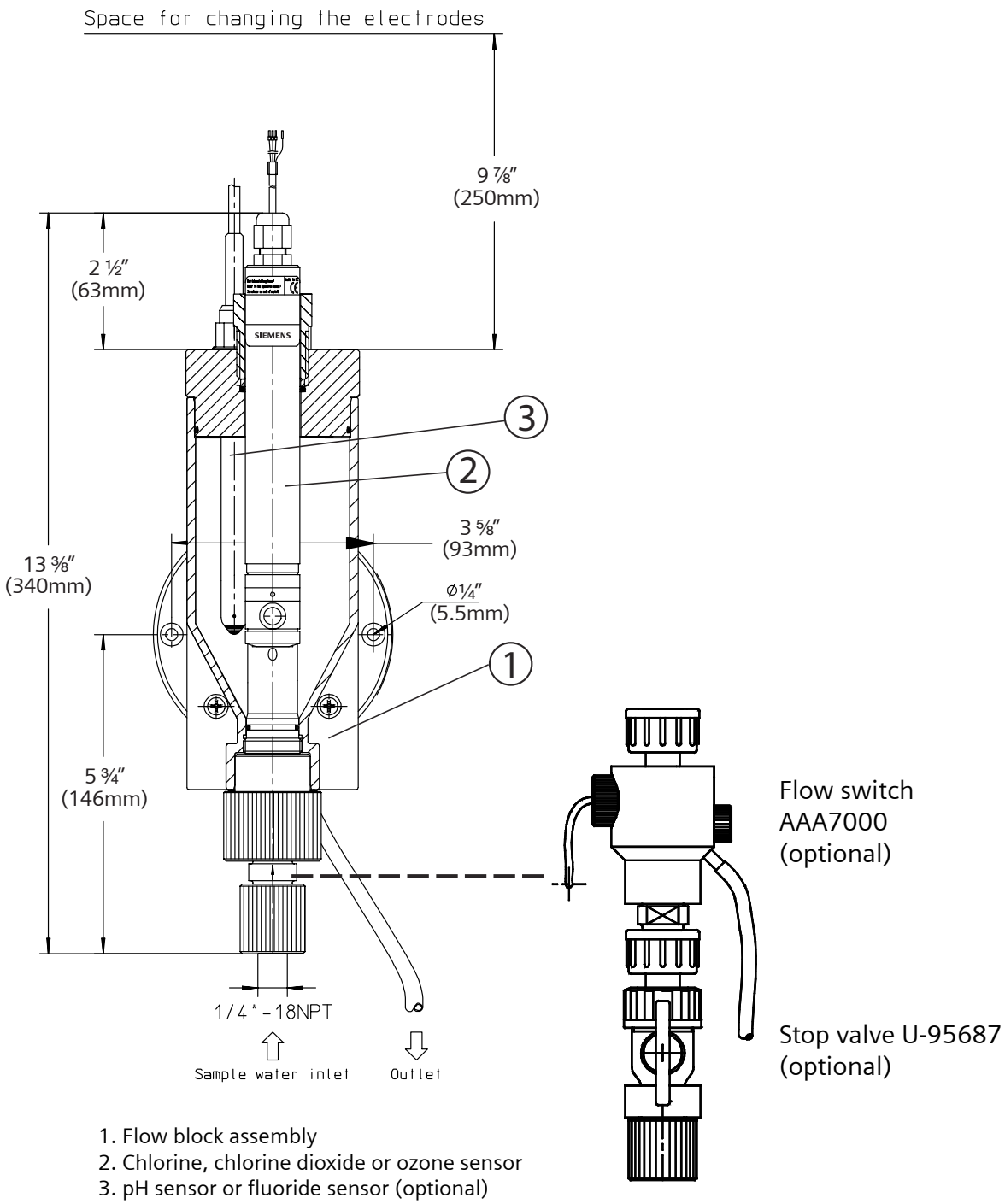
AAB5383 DEPOLOX® 3 *plus* BARE ELECTRODE MEASURING CELL - DIMENSIONS
(With PT 100 Temperature Sensor)

50.560.100.020
ISSUE 2 6-07



AAC6208 DEPOLOX® 5 BARE ELECTRODE MEASURING CELL - DIMENSIONS
(With PT 1000 Temperature Sensor)

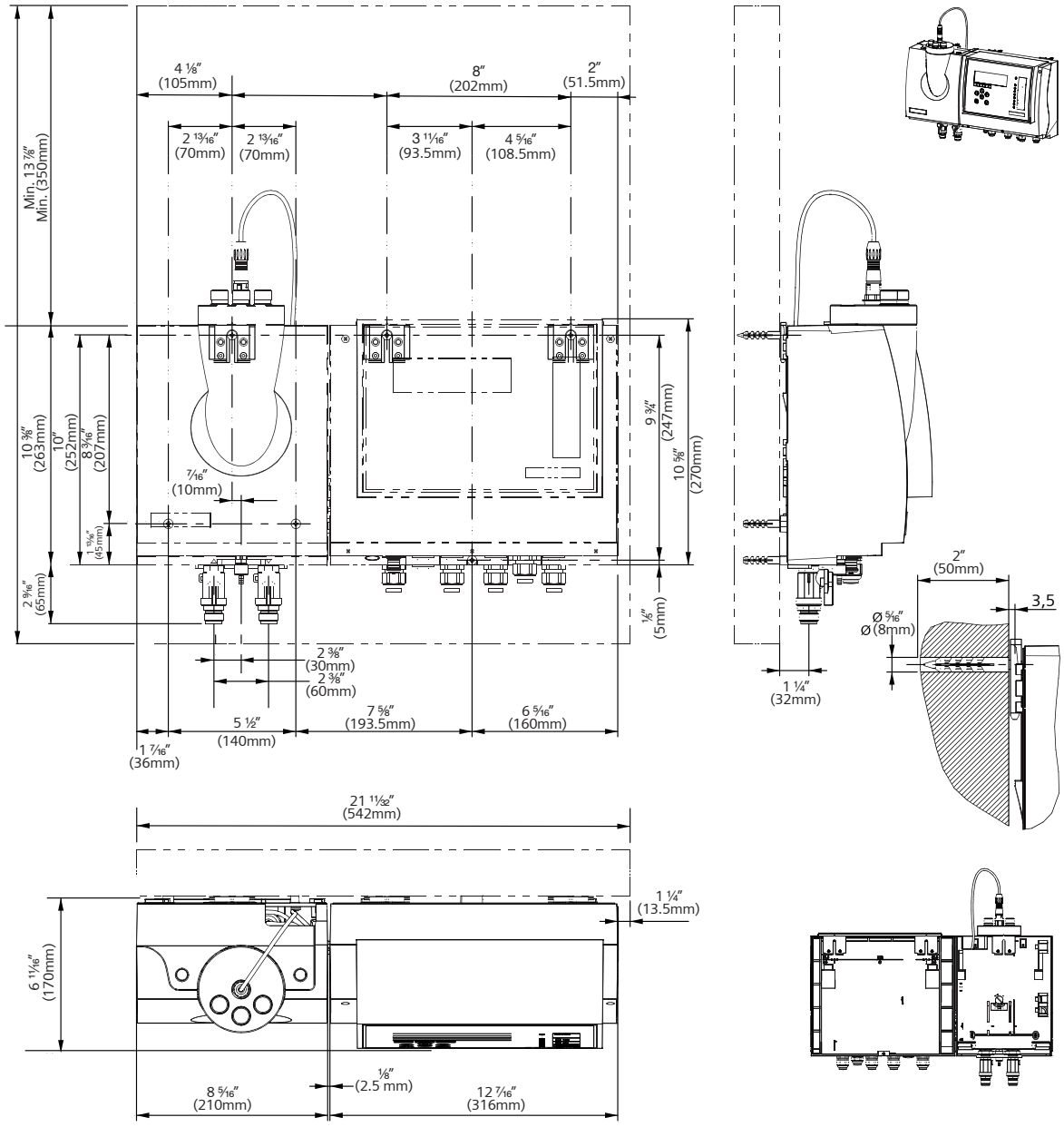
50.560.100.050
ISSUE 0 6-07



1. Flow block assembly
2. Chlorine, chlorine dioxide or ozone sensor
3. pH sensor or fluoride sensor (optional)

DEPOLOX® 3 *plus* MEMBRANE MEASUREMENT PACKAGE - DIMENSIONS
Sensors & Flow Block Assembly

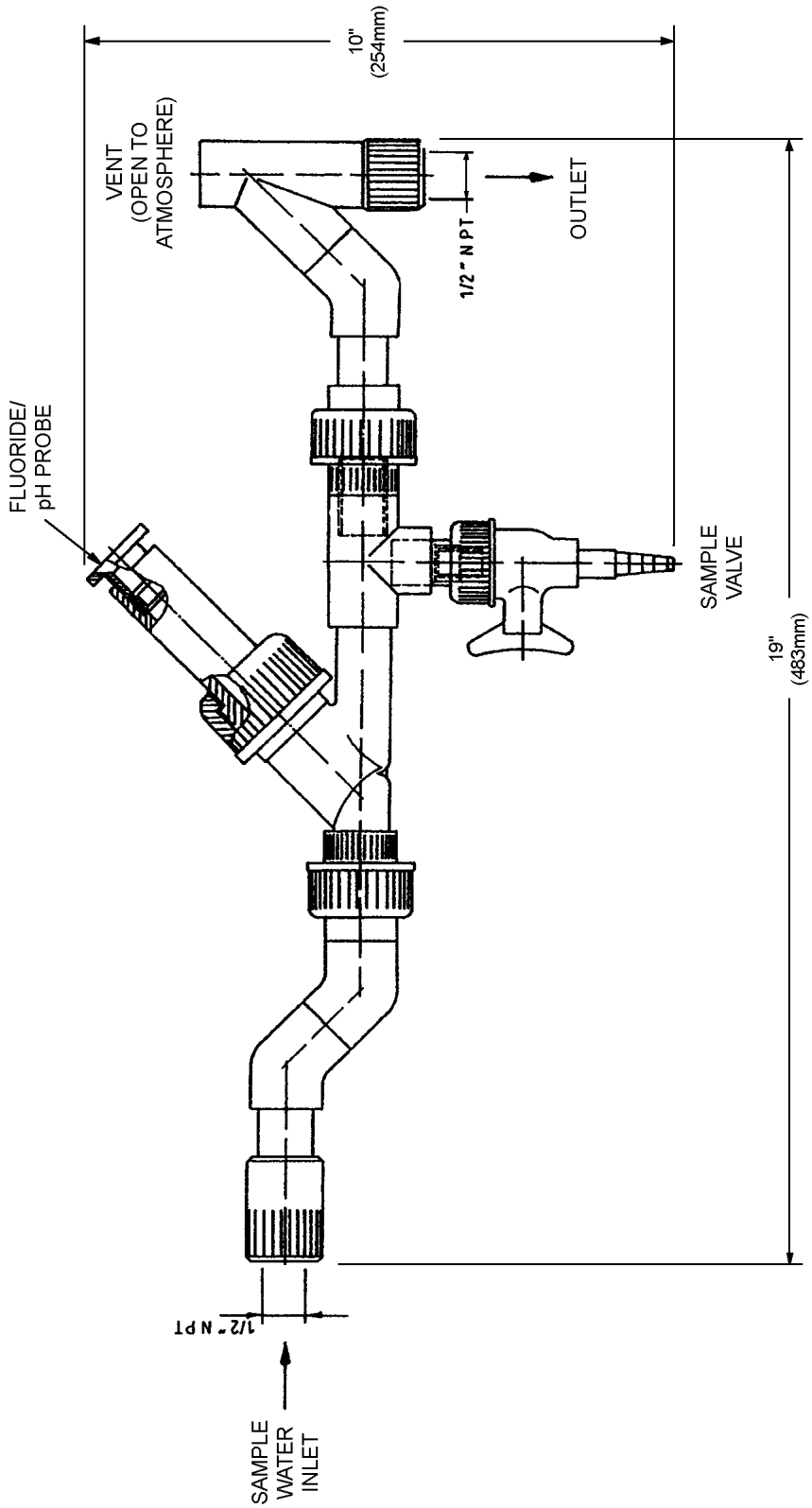
50.560.100.030
ISSUE 2 6-07



VARIASENS™ MEMBRANE MEASURING CELL - DIMENSIONS

50.560.100.060

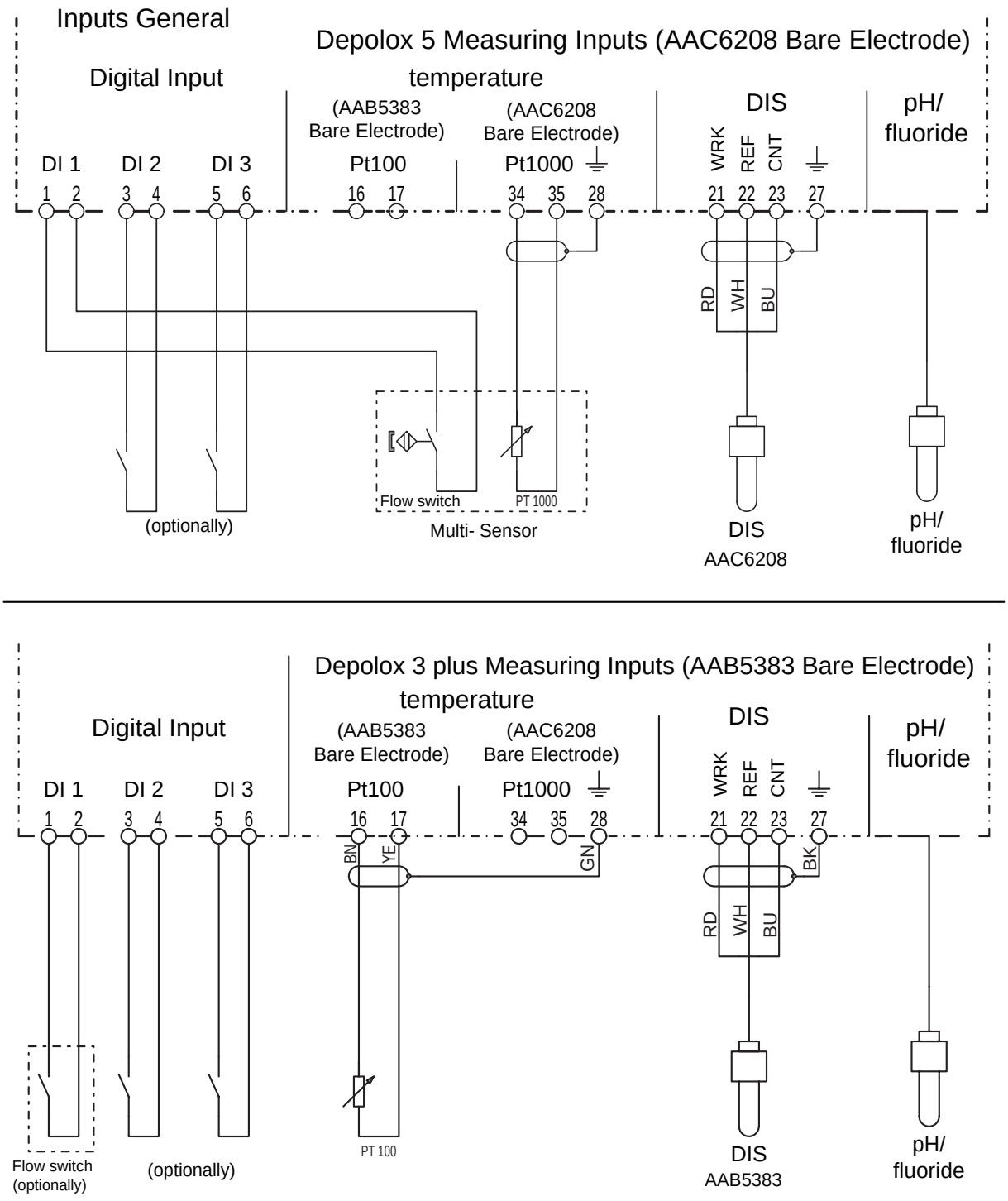
ISSUE 0 6-07



U95224 FLUORIDE/pH STANDALONE WETSIDE - DIMENSIONS

50.560.100.040

ISSUE 1 6-07

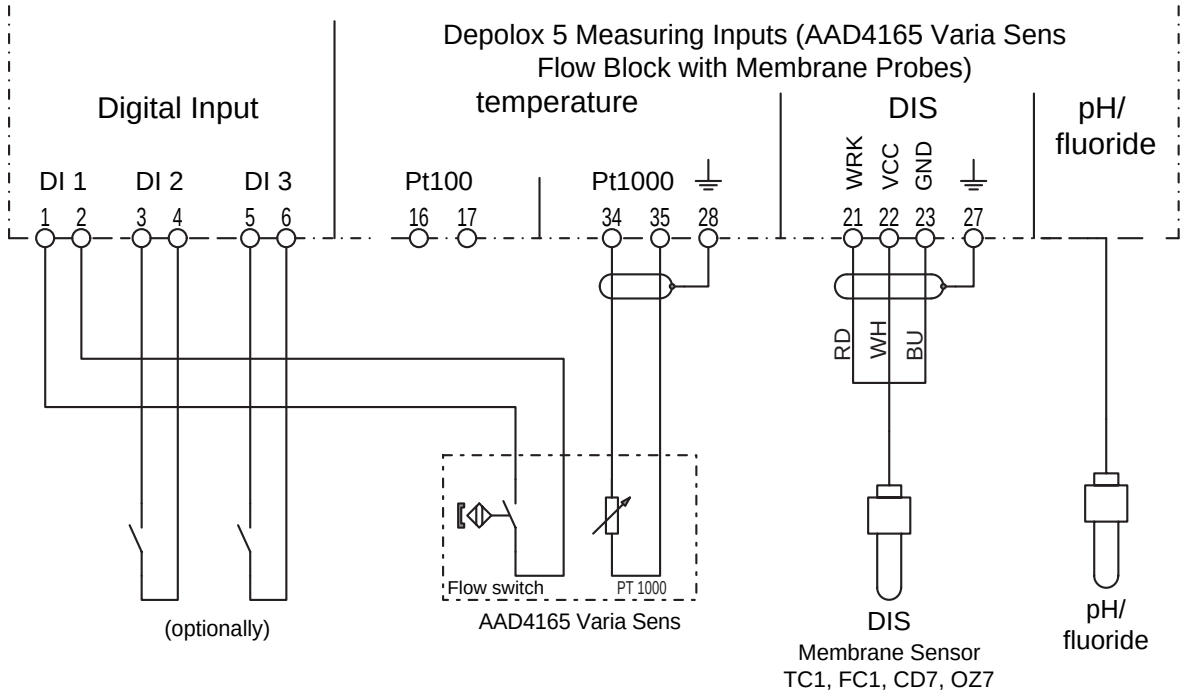


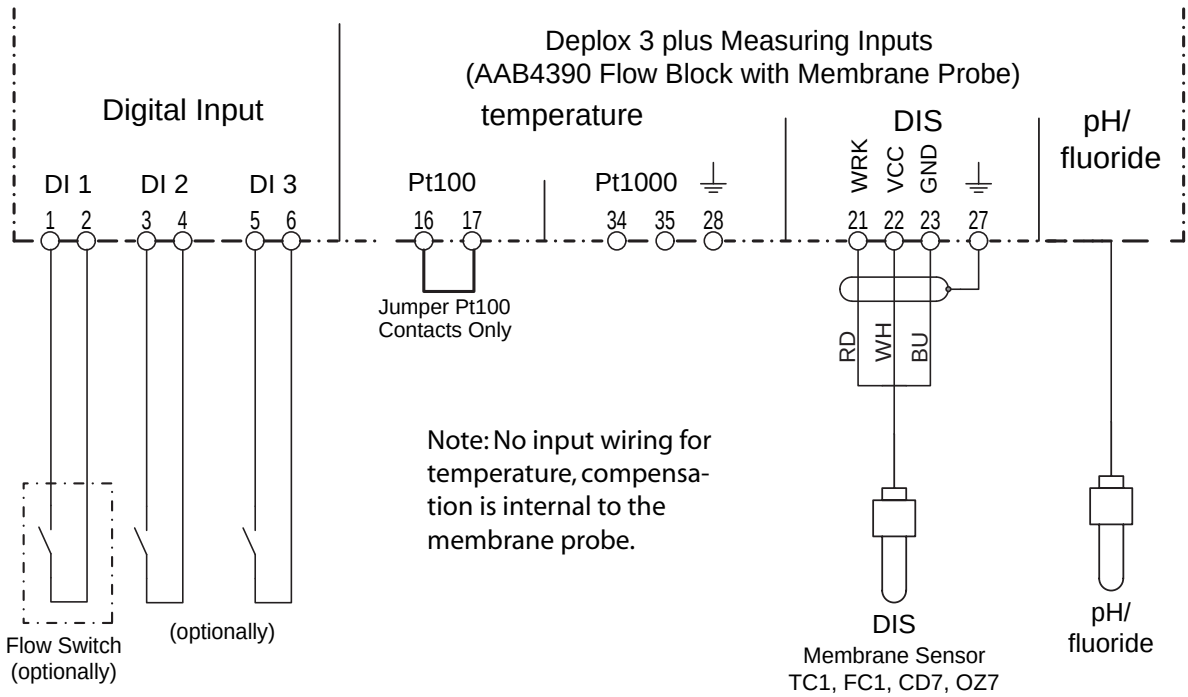
NOTE: FIELD WIRING (NOT BY SIEMENS WATER TECHNOLOGIES) MUST CONFORM TO LOCAL ELECTRICAL CODES.

Depolox® ANALYZERS WITH BARE ELECTRODE SENSOR KIT - WIRING

50.560.155.010

ISSUE 2 6-07





NOTE: FIELD WIRING (NOT BY SIEMENS WATER TECHNOLOGIES) MUST CONFORM TO LOCAL ELECTRICAL CODES.

Depolox® ANALYZERS WITH MEMBRANE SENSOR KIT - WIRING

50.560.155.020

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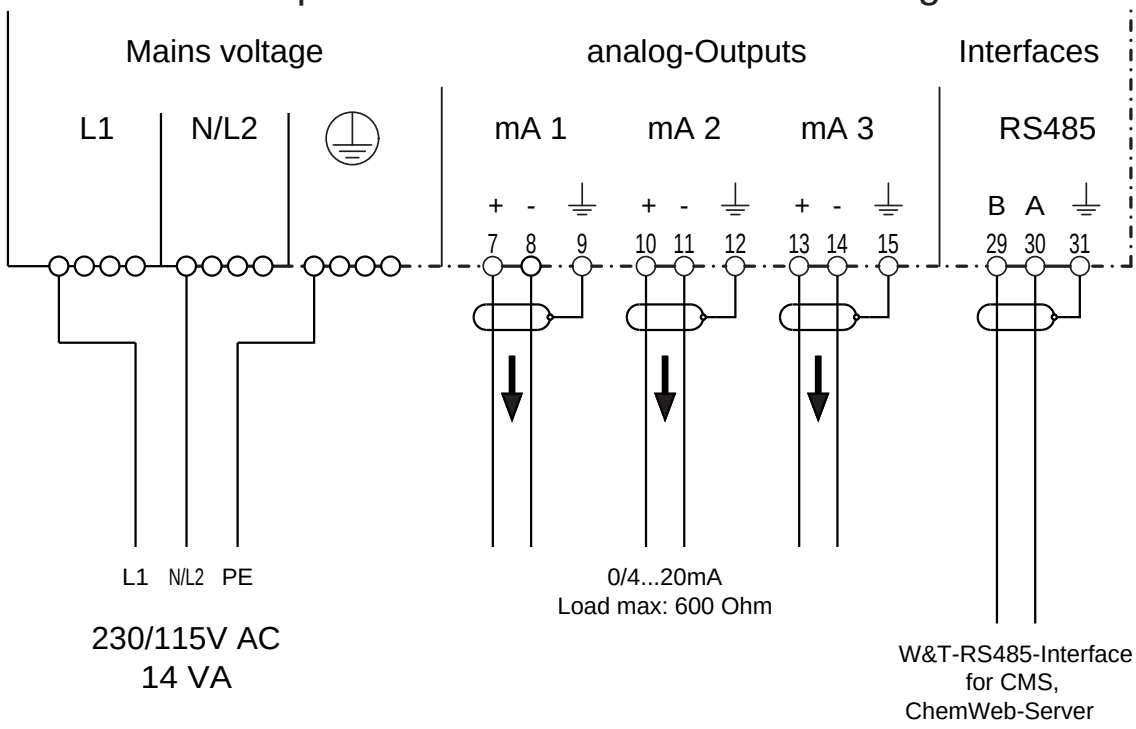
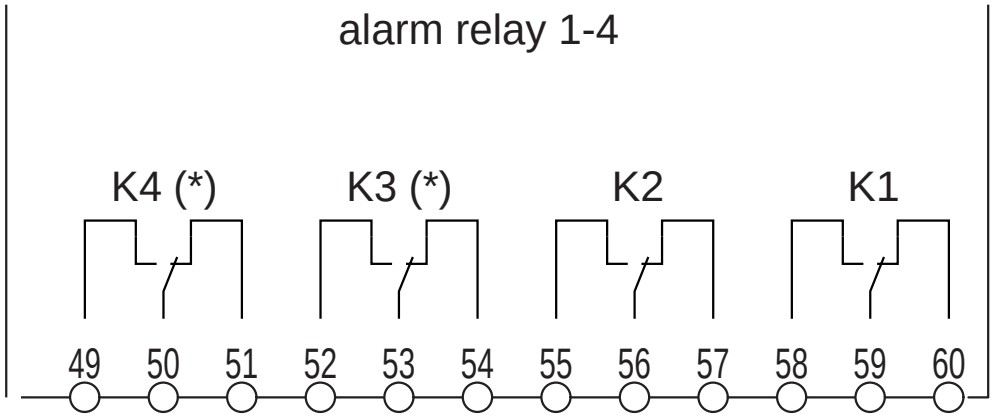
Depolox 3 Plus Main and mA - Wiring



alarm relay 1-4



(*) only on dual electronics

NOTE: FIELD WIRING (NOT BY SIEMENS WATER TECHNOLOGIES) MUST CONFORM TO LOCAL ELECTRICAL CODES.

Depolox® 3 *PLUS* - ALARM RELAY CONNECTIONS; MAIN AND mA - WIRING

50.560.155.050

ISSUE 2 6-07

SECTION 3 - OPERATION

List of Contents

List of Contents (Cont'd)

3.1 Depolox® 3 *plus* - Operation

3.1.1 General Description

The Depolox 3 *plus* module is a microprocessor-controlled electronic amplifier for the measurement of Disinfectants, and/or for pH value or fluoride in water.

The built-in RS485 interface can be used to transfer the measured values and operating modes to a PC or SCADA system.

3.1.2 Display and Keypad

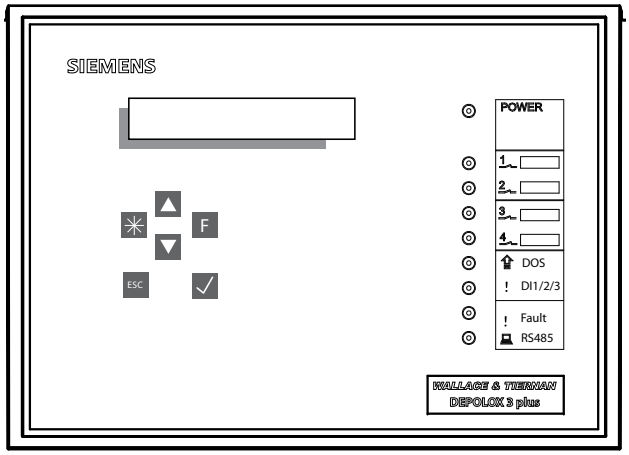


Figure 3.1 - Display and Keypad

3.1.2.1 Keypad Functions

ACKNOWLEDGE ALARM - De-energize the alarm relays (this does not reset the alarm message)

ESCAPE - Terminate input without saving new value. Jump back to the menu title and return to basic display by pressing the key once more.

UP ARROW - Skip one level upwards, increase value or display previous option.

DOWN ARROW - Skip one level downwards, reduce value or display next option.

F — Display next menu (jump from menu title to menu title)

✓ — ENTER - change into change mode (“>” is displayed before the value), - save new setting.

NOTE: Check that any alterations have been ENTERED before exiting the menu. Protect the menus from unauthorized operation with a code number of your choice (1 to 999) (refer to paragraph 3.1.3, Code Number).

Press the keypads only with the fingers, do not use hard or pointed objects like pencils, etc., as these could damage the sealed keypad.

3.1.2.2 Selecting the Menus

- From the basic display, access to the other menu paths is achieved by pressing the **F** key.
- Sub menus are accessed using the keys ▲ and ▼. To exit from a sub menu to a main menu and then to the basic display press the **ESC** key.

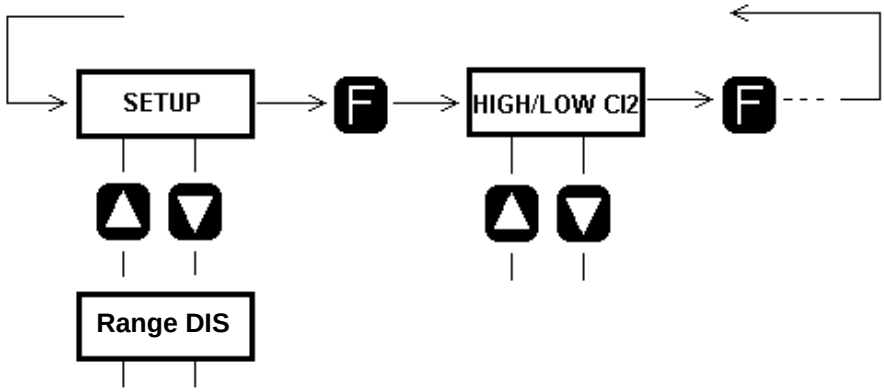


Figure 3.2 - Menu Selection

3.1.2.3 Changing the Settings

a. Select the menu to be changed.

b. Press the ✓ key, “>” is displayed.

c. Using the arrow keys increase or decrease the value or skip to the next selection.

d. Store the changed setting by pressing the ✓ key.

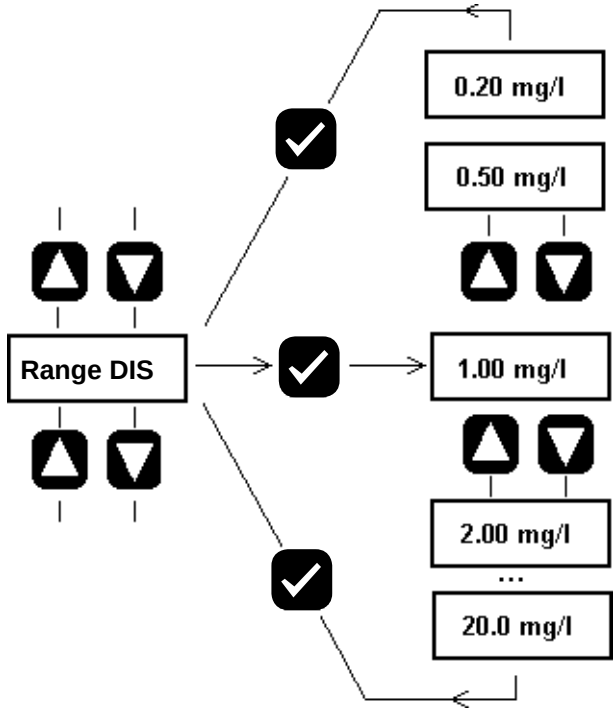


Figure 3.3 - Setting Changes

As long as the new value has not been stored by pressing the ✓ key, pressing the **ESC** key will return to the former setting. Select the next menu to be accessed with the arrow keys ▲ and ▼.

3.1.3 Menu Summaries

These summaries contain all menus of the respective versions. Depending on the setting a few menus are not necessary and therefore not displayed.

Table 3.1 - Menu List / Disinfection Only

ROOT	CALIBRATION	HIGH/LOW	ALARM RELAY 1/2	ALARM RELAY 3/4	SETUP	SETUP mA	SIGNAL DIAG.	SYSTEM DIAG.
DIS Value	DIS zero *	DIS min	Relay Assign 1	Relay Assign 3	Range DIS	mA Output	Cell DIS	Keypad Test
Temperature*	DIS span	DIS max	Relay Function 1	Relay Function 3		mA 1 Assign	Temperature *	Display Test
Menu Extend		DIS setpoint	Relay Delay 1	Relay Delay 3		mA 2 Assign		System Reset
		DIS deadband	Relay Assign 2	Relay Assign 4	Code Definition	mA 3 Assign	mA Out 1	System Shutdown
			Relay Function 2	Relay Function 4	Hold Function		mA Out 2	RS485
			Relay Delay 2	Relay Delay 4	Language		mA Out 3	Software Release
					RS485 addr. DIS		Local Operation	
					DIS Sensor		Rel.: 1 2 3 4	
					Select		DI: 1 2 3	
					Temperature		VF Conv. 1	

* Bare Electrode only.

Table 3.2 - Menu List / Disinfection + pH

ROOT	CALIBRATION	HIGH/LOW DIS	ALARM RELAY 1/2	ALARM RELAY 3/4	SETUP	SETUP mA	SIGNAL DIAG.	SYSTEM DIAG.
DIS Value	DIS zero*	DIS max.	Relay Assign 1	Relay Assign 3	Range DIS	Cal. code	Cell DIS	Keypad Test
pH Value	DIS span	DIS min.	Relay Function 1	Relay Function 3	Range pH	Cal. DIS 4mA	pH sensor	Display Test
Temperature	Offset pH	DIS Setpoint	Relay Delay 1	Relay Delay 3	Code Definition	Cal. DIS 20mA	Temperature	System Reset
Menu Extent	Calibr. at pH 7.00	DIS Deadband	Relay Assign 2	Relay Assign 4	Hold Function	Cal. pH 4mA	mA Out 1	System Shutdown
	Calibration pH	pH max.	Relay Function 2	Relay Function 4	Language	Cal. pH 20mA	mA Out 2	RS485
	Calibration Temp.	pH min.	Relay Delay 2	Relay Delay 4	RS485 addr.	mA output	mA Out 3	Software Release
		pH Deadband			DIS Sensor	mA 1 Assign.	Local Operation	
					Select (pH)	mA 2 Assign.	Rel.: 1 2 3 4	
					Mode Cl2 free*	mA 3 Assign.	DI: 1 2 3	
					Temperature		VF Conv. 1	
							VF Conv. 2 *	
							VF Conv. 3 (temp)	

* Bare Electrode only.

Table 3.3 - Menu List / Disinfection + Fluoride

ROOT	CALIBRATION	HIGH/LOW	ALARM RELAY 1/2	ALARM RELAY 3/4	SETUP	SETUP mA	SIGNAL DIAG.	SYSTEM DIAG.
DIS Value	DIS zero*	DIS max.	Relay Assign 1	Relay Assign 3	Range DIS	mA Output	Cell DIS	Keypad Test
	DIS span	DIS min.	Relay Function 1	Relay Function 3	Code Definition	mA 1 Assign	Fluor Sensor	Display Test
Fluor Value		DIS Setpoint	Relay Delay 1	Relay Delay 3	Hold Function	mA 2 Assign	Temperature	System Reset
Temperature	Fluor offset	DIS Deadband	Relay Assign 2	Relay Assign 4	Language	mA 3 Assign	mA Output 1	System Shutdown
Menu Extend	Fluor zero	Fluor max.	Relay Function 2	Relay Function 4	RS485 addr.		mA Output 2	RS485
	Fluor span	Fluor min.	Relay Delay 2	Relay Delay 4	DIS Sensor		mA Output 3	Software Release
	Calibration Temp	Fluor Deadband			Select (Fluoride)		Local Operation	
					Temperature		Rel.: St:	
							Dl: St:	
							VF Conv. AE1	
							VF Conv. AE2	
							A/D AE3	

* Bare Electrode only.

3.1.3.1 Display Menu

Display	Value Range (defaults bold)	Description
Free Chlorine **0.00mg/l**	range	**1. measurement with unit and sensor type** Free Chlorine Total Cl_2 TC1 Free Cl_2 FC1 Ozone OZ7 Chlorine Dioxide
pH-value **7.00pH** or **Fluor** **0.00mg/l**	range	**2. measurement with unit** selectable between pH or fluor measurement
Temperature **20°C**	range	**3. measurement with unit**
menu	short **long**	**menu length** - short menu; only main display and calibration is shown - leng menu: all menus are shown
Code	**000** 999	**Code** input of the code number Only if this value is the same as defined in “Code-Def.” - menu, you can adjust settings. If not the error message “code ???” is shown. This menu only appears if the user code is not 000.

3.1.3.2 Calibration Menu

Display	Value Range (defaults bold)	Description
CALIBRATION		**Calibration-Menu** All calibration settings take place via this menu path.
DIS zero	range	**Disinfection - zero adjustment** Pressing the Check-button sets the disinfection reading to zero.
DIS span	range	**Disinfection - span adjustment** You put in the result of the Comparison measurement to calibrate the disinfection span.
offset pH	-1.00 pH +1.00 pH **0.00 pH**	**pH-Offset-Adjustment** (only in case of pH-selection) This value is added to the actual pH reading.
calibr. at pH7	range	**pH-Calibration** (only in case of pH-selection) First point of the pH-calibration.
calibration pH	range	**pH-Calibration** (only in case of pH-selection) Second point of the pH-calibration.
offset fluor	-1.00 mg/l +1.00 mg/l **0.00** mg/l	**Fluoride-Offset-Adjustment** (only in case of fluoride-selection) This value is added to the actual fluoride reading.
Fluor zero	range	**Fluoride-Calibration** (only in case of fluoride-selection) First point of the fluoride-calibration (two point calibration).
Fluor span	range	**Fluoride-Calibration** (only in case of fluoride-selection) Second point of the fluoride-calibration (two point calibration).
calibration temp	**20.0°C** -5.0°C +5.0°C	**Calibration of sample water temperature** You can adjust the reading of the sample water measurement (-5...+5°C).

3.1.3.3 High/Low Menu

Display	Value Range (defaults bold)	Description
HIGH/LOW		**High/Low - Limits**
DIS max	range **0.80 mg/l**	**Max. limit-value for the disinfection measurement**
DIS min	range **0.10 mg/l**	**Min. limit-value for the disinfection measurement**
DIS setpoint	range **0.10 mg/l**	**Dosing contact**
DIS deadband	1 Digit 25 Digit **3 Digit**	**Deadband for the disinfection limits**
pH max	range **7.80 pH**	**Max. limit-value for the pH measurement** (only in case of pH-selection)
pH min	range **6.80 pH**	**Min. limit-value for the pH measurement** (only in case of pH-selection)
pH deadband	1 Digit 25 Digit **3 Digit**	**Deadband for the pH limits** (only in case of pH-selection)
Fluor max	range **2.00 mg/l**	**Max. limit-value for the fluoride measurement** (only in case of fluoride-selection)
Fluor min	range **0.20 mg/l**	**Min. limit-value for the fluoride measurement** (only in case of fluoride-selection)
Fluor deadband	1 Digit 25 Digit **3 Digit**	**Deadband for the fluoride limits** (only in case of fluoride-selection)

3.1.3.4 Alarm Relay 1/2 Menu

Display	Value Range (defaults bold)	Description
ALARM RELAY 1/2		**Definitions for alarm realy 1 and 2**
relay assign. 1	DIS max DIS min pH max pH min Fluor max Fluor min DI1 DI2 DI3 gen. fault dosing cont.	**Assignment for alarm relay 1** (multiple selection possible)
realy function 1	**N.O. unlatched** N.C. unlatched N.O. latched res N.C. latched res N.O. latched ack N.C. latched ack	**Operation mode and function for alarm relay 1** N.O.: normally open N.C.: normally closed unlatched: relay not latching latched res.: latching, reset latched ack.: latching, reset with acknowledge (not visible when dosing contact is selected)
relay delay 1	**0 min** 600 min	**Delay time for alarm relay 1** (not visible when dosing contact is selected)
relay assign. 2	DIS max DIS min pH max pH min Fluor max Fluor min DI1 DI2 DI3 gen. fault	**Assignment for alarm relay 2** (multiple selection possible)
realy function 2	N.O. unlatched N.C. unlatched N.O. latched res N.C. latched res N.O. latched ack N.C. latched ack	**Operation mode and function for alarm relay 2** N.O.: normally open N.C.: normally closed unlatched: relay not latching latched res.: latching, reset latched ack.: latching, reset with acknowledge
relay delay 2	**0 min** 600 min	**Delay time for alarm relay 2**

3.1.3.5 Alarm Relay 3/4 Menu

Display	Value Range (defaults bold)	Description
ALARM RELAY 3/4		**Definitions for alarm realy 3 and 4**
relay assign. 3	DIS max DIS min pH max pH min Fluor max Fluor min DI1 DI2 DI3 gen. fault	**Assignment for alarm relay 3** (multiple selection possible)
realy function 3	**N.O. unlatched** N.C. unlatched N.O. latched res N.C. latched res N.O. latched ack N.C. latched ack	**Operation mode and function for alarm relay 3** N.O.: normally open N.C.: normally closed unlatched: relay not latching latched res.: latching, reset latched ack.: latching, reset with acknowledge
relay delay 3	**0 min** 600 min	**Delay time for alarm relay 3**
relay assign. 4	DIS max DIS min pH max pH min Fluor max Fluor min DI1 DI2 DI3 gen. fault	**Assignment for alarm relay 4** (multiple selection possible)
realy function 4	N.O. unlatched N.C. unlatched N.O. latched res N.C. latched res N.O. latched ack N.C. latched ack	**Operation mode and function for alarm relay 4** N.O.: normally open N.C.: normally closed unlatched: relay not latching latched res.: latching, reset latched ack.: latching, reset with acknowledge
relay delay 4	**0 min** 600 min	**Delay time for alarm relay 4**

3.1.3.6 Setup Menu

Display	Value Range (defaults bold)	Description
SETUP		**Setup-menu**
range DIS	0 - 0.20 mg/l 0 - 0.50 mg/l 0 - 1.00 mg/1 0 - 2.00 mg/l **0 - 5.00 mg/l** 0 - 10.0 mg/l 0 - 20.0 mg/l	**Range for the disinfection measurement**
range pH	**4 - 10.00 pH** 0 - 14.00 pH	**Range for the pH measurement**
code definition	**000** 999	**Definition of the lock code**
hold function	**on** off	**Hold-Function** If switched on, the readings of the measurements are frozen as long as you stay in the calibration (no peeks on the line recorder, no switching of the alarm relays).
language	german **english** french spanish	**Language of the menus**
RS485 address	00 31	**Bus address for RS485-Mode**
DIS-sensor	3-electr.system Membrane sensor TC1 FC1 OZ7 CD7 Off	**Selection of the connected disinfection sensor** Selection of membrane sensor or 3 electrode system (bare electrode) on the PCB with dip switches.
select	**pH** Fluor Off	**Selection of the second input sensor**
temperature	PT100 **PT1000** Off	**Selection of the used temperature sensor**
mode Cl2 free	**normal** pH compensated	**Selection of the calculation for the disinfection sensor** (only in case of 3-electr.system + pH + temperature on)

3.1.3.7 Setup mA Menu

Display	Value Range (defaults bold)	Description
SETUP mA		**Setup-Menu** (general setup, communication connections)
mA output	0 - 20 mA 4 - 20 mA **AUS**	**Mode of the mA-Outputs**
mA1-assign.	**DIS** pH Fluor temperature	**Assignment of the mA-output 1**
mA2-assign.	DIS **pH** Fluor temperature	**Assignment of the mA-output 2**
mA3-assign.	DIS pH Fluor **temperature**	**Assignment of the mA-output 3**

3.1.3.8 Signal Diagnosis Menu

Display	Value Range (defaults bold)	Description
SIGNAL DIAG.		**Signal Diagnosis Menu**
cell DIS	+3.5 µA 5µA/mg/l (1µA) 0 h	**Informations about the DIS-cell** With pressing the Check-Button, you can step between following informations: - actual reading of the cell current - calibration data (zero and span) - past hours since the last calibration
pH sensor	+59 mV 59mV/pH (+5mV) 0 h	**Informations about the pH-sensor** With pressing the Acknowledge-Button, you can step between following informations: - actual reading of the cell voltage - calibration data (zero and span) - past hours since the last calibration
fluor sensor	+59 mV 59mV/pH (+5mV) 0 h	**Informations about the fluor-sensor** With pressing the Acknowledge-Button, you can step between following informations: - actual reading of the cell voltage - calibration data (zero and span) - past hours since the last calibration
temperature	21.3° C (+2.7° C) 0 h	**Informations about the temperature measurement** With pressing the Acknowledge-Button, you can step between following informations: - actual reading of the uncalibrated temperature - calibration offset - past hours since the last calibration
mA output 1 **4 mA 0%**		**Informations about mA-output 1** The output value is shown in mA and in %
mA output 2 **4 mA 0%**		**Informations about mA-output 2** The output value is shown in mA and in %
mA output 3 **4 mA 0%**		**Informations about mA-output 3** The output value is shown in mA and in %
local operation	**normal** service	**Special mode for system service** Relay outputs are frozen in non-alarm states. mA output is frozen. Analyzer will not return to main display. Operating mode is automatically set to normal when leaving the diagnostics menu group or cycling power.

Signal Diagnosis Menu (Cont'd)

Display	Value Range (defaults bold)	Description
REL: 1 2 3 4 **St: 1 0 0 0**		**Informations about the relay status** 1: alarm relay 1 (0: unpowered/1: powered) 2: alarm relay 2 3: alarm relay 3 4: alarm relay 4 Press Enter and then the up or down arrow to select the relay, to change the relay state for testing press Enter. After leaving this menu the relay goes back to previous state.
DI: 1 2 3 **St: 1 0 0**		**Informations about the digital status** 1: digital input 1 0: closed (inactive) 2: digital input 2 1: open (active) 3: digital input 3
VF Conv. AE1 **14.07 kHz**		**Actual measurement of the input 1** (disinfection)
VF Conv. AE2 **14.07 kHz**		**Actual measurement of the input 2** (pH or fluoride)
A/D (PT1000) AE3 **356 Digit** **or** **A/D (PT100) AE3** **356 Digit**		**Actual measurement of the input 3** (temperature)

3.1.3.9 System Diagnostics Menu

Display	Value Range (defaults bold)	Description
SYSTEM DIAG.		**System Diagnosis Menu**
keypad test	press Acknowl. press Up press Down press Star press ESC press F	**Test of all buttons of the keypad**
display test		**Test of the display** All dots of the matrix display are on.
system restart	**no** yes	**Restart of the system (RESET)**
system shutdown	**no** yes	**Shutdown the system** All functions are disabled, only a dot is shown in the display. Wakeup is initialized with pressing any button.
RS485		**Informations about the RS485 Communication** A valid communication on the RS485 interface is shown with the message “RxD”, “TxD” and INT”.
softwarerelease	V: 1.00 19.JUL.2006 EAE1053 FRG 49	**Informations about the internal software release** Alternating display

3.1.4 Code Number

To protect the settings against unauthorized access or an inadvertent change, the settings should be locked using a freely selectable code number. The settings can be displayed, but not changed. If an attempt is made, then “Code???” is displayed before reverting to the former setting.

After switching on, after a RESET or generally after one hour without pressing a key, the code number is set to 0. If the unit is locked, settings can only be changed after entry of the correct code number. Locking can be selected in the “Lock Setting” menu.

To alter the number again, enter the new code number in the SETUP menu under “Lock code set”. If you then want to block access to unauthorized operators, immediately change the code in the SETUP menu to another number and set to “Locked” in the “Lock Setting menu”.

In order to provide general access, select “Unlocked”. This means that changes are possible at any time without having to enter a code. Code is no longer displayed in the main menu. However, another code number can now be entered and access denied to all those operators who do not know the new number.

The unit is delivered with the “Lock code set” = 0, “Lock setting” = Unlocked. If the code number is forgotten enter the back entry code 911. You can only alter the values in the protected menus once you have set the correct code number in the SETUP menu and thus proved that you are an authorized operator.

3.1.5 High - Low Alarms

The Depolox® 3 *plus* has independent alarms that can be allocated to the measured values for chlorine (and optionally for pH or fluoride).

Menu Setting	Alarm Condition	Action
High	X ≥ alarm value	alarm message on
	X ≤ (alarm value - deadband)	alarm message off
Low	X ≤ alarm value	alarm message on
	X ≥ (alarm value - deadband)	alarm message off

The deadband can be set in the range of one to 25 digits.

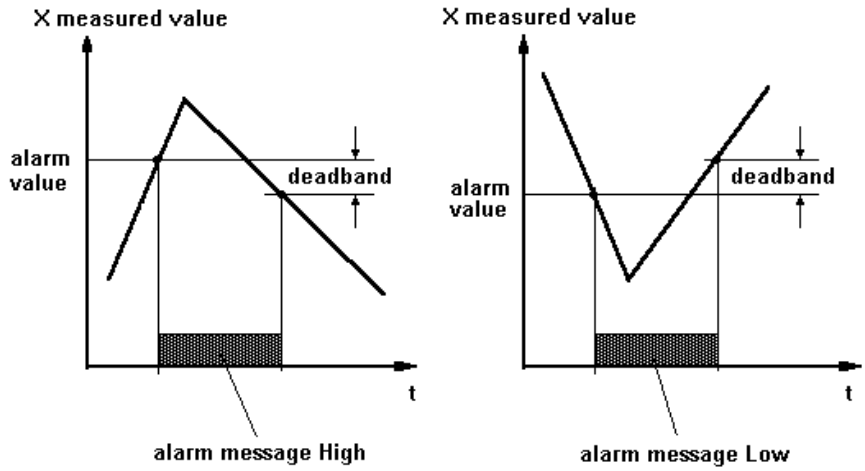


Figure 3.4 - High / Low Alarms

3.1.6 Alarm Relays

Depolox® 3 *plus* features the following alarm relays:

- Two relays in single electronics unit.
- Four relays in dual electronics unit.

Definitions for switching the relays:

DIS max:	relay reacts to the set value
DIS min:	relay reacts to the set value
pH max:	relay reacts to the set value
pH min:	relay reacts to the set value
Fluor max:	relay reacts to the set value
Fluor min:	relay reacts to the set value
DI1, DI2, DI3:	relay is activated as long as there is a signal on the digital input
general fault:	relay is activated as long as there is an alarm message
dosing contact:	relay is energized as long as the actual value is below the setpoint (for relay 1 only)

Selections:

normally open (N.O.):	relay is energized in case of an alarm.
fail safe (N.C.):	relay is de-energized in case of an alarm
non latching:	relay is de-energized as soon as the alarm condition has ceased
latching:	relay stays energized after the alarm until the star key "✳" is pressed to acknowledge the alarm

3.1.7 Dosing Contact for Chlorine

The chlorine alarm relay 1 can be used to switch-on a pump or solenoid valve for dosing chlorine.

The relay is energized if "AR 1 Definition" is set to "dosing contact" and the actual value is < setpoint.

3.1.8 mA Outputs

For each sensor there is an mA current signal output (e.g., for connecting an additional display). The range fixed at 4...20mA corresponds to the measuring range. For example, for a Membrane range of 0 to 5 mg/l:

0 mg/l: 4 mA
5 mg/l: 20 mA

The signal that is output corresponds to the measured value. The connected impedance must not be higher than 1000 Ohm. Broken wires or open mA loops will be detected.

3.1.9 Restoring Factory Settings (Initialize)

If the instrument does not respond correctly to software adjustments or corrections, or if software or hardware conditions have changed significantly, the operator may restore factory settings to return the software to normal operating parameters by performing the following operation.

Remove power to the electronics. Return power, while pressing and holding the ✳ button until "INIT" appears, then release. Factory settings have now been restored.

<u>NOTE</u>: Restoring the factory settings does not guarantee correct operation and may produce a reduced accuracy, until calibration, if operation does occur.

3.2 Depolox® 3 *plus* - Calibration

3.2.1 Free Chlorine (AAB5383 and AAC6208 Bare Electrode) Calibration

When calibrating with the pH compensation option, note that the pH value must be calibrated or verified first so that the subsequent Cl_2 calibration is automatically adjusted by the correct pH value.

To achieve this, the prompt "pH correct, yes/no?" appears in the menu. When confirmed by "Yes," direct access is granted to chlorine calibration "Zero Calibration," below. If answered with "No," pH calibration follows.

NOTE: The relays and mA outputs follow the measured values. If necessary, switch off the alarm relays.

- Zero Calibration

  a. Starting from the basic display press the **F** key until the "CALIBRATION" menu is displayed. Press the ▼ key until the "Cl_2 zero" menu is found.

  b. Close the shut-off valve at the flow block assembly, stopping all flow to unit. Wait until the displayed value ceases changing.

  c. Press the ✓ key twice in order to set the display to "0.00".

  d. Go to the root menu. Display will be 0.00 mg/l

     In case of calibration error *Cal. Cl_2?*: Ensure that the sample water is completely stopped and repeat calibration. If the error comes again, adjust the cell voltage Upot: Go to SIGNAL DIAG. and menu "Cl_2 cell current".

     If he display still does not read 0.00 mg/l after calibration, adjust the potentiometer Upot so far that the displayed cell current is 0 ±5 µA (turning clockwise reduces the current) (see Figure 3.5). The current will change very slowly. Wait one half hour and check again. Perform calibration again.

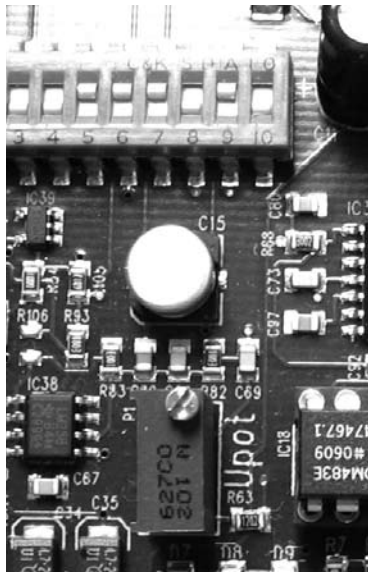


Figure 3.5 - Upot Adjustment

e. Let the sample water flow again.

<u>NOTE</u>: When there is no key pressed for five minutes, the Depolox® 3 *plus* returns to the basic display.

- Span calibration

  a. After zero calibration wait at least two minutes. Then take a sample at the measuring cell. Determine the residual value of this sample.

  b. Press the ▼ key until the menu "DIS span" is reached. Press the ✓ key to open the menu.

  c. Press keys ▼ or ▲ until the displayed value agrees with the manually measured value.

  d. Store the value using the ✓ key. The chlorine measuring cell is now calibrated. In case of an error message, refer to paragraph 4.1.1, Errors.

  e. Return to the basic display by pressing the **ESC** key twice.

3.2.2 Membrane Sensor Calibration (All Membrane Types)

a. Take a sample at the measuring cell. Determine the residual value of this sample.

b. Starting from the basic display, press the **F** key until the "Calibration" menu is displayed.

c. Press the ▼ key until the menu "DIS span" is reached. Press the ✓ key to open the menu.

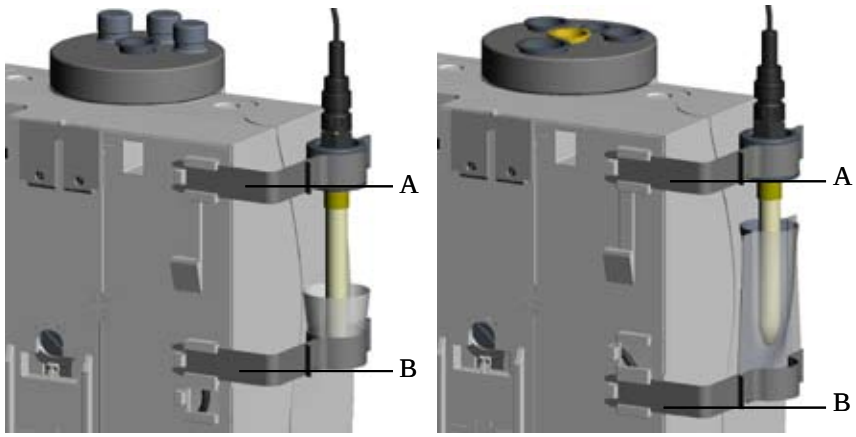
d. Press keys ▼ or ▲ until the displayed value agrees with the manually measured value.

e. Store the value using the ✓ key. The disinfectant measuring cell is now calibrated. In case of an error message refer to paragraph 4.1.1, Errors.

f. Return to the basic display by pressing the **ESC** key twice.

Calibration Aids

Two clips are installed in the housing cover of the AAC6208 Bare Electrode and the AAD4165 VariaSens™. These clips can be inserted into the rear panel of the housing. The clip (A) for the sensor will be inserted into the upper catch. When the electrodes are calibrated in the beaker with the calibration solution, the second clip (B) will be inserted into the catch (left figure). The lower clip position is provided for calibrating with the calibration solution bag (right figure).



A	Upper clip
B	Lower clip

3.2.3 pH Calibration

NOTE: pH measurement is optional.

WARNING: DO NOT CONTINUE TO USE BUFFER SOLUTIONS AFTER USE-BY DATE. BUFFER SOLUTIONS THAT HAVE BEEN OPENED CAN ONLY BE KEPT FOR A LIMITED PERIOD. READ THE LABEL ON THE BOTTLE.

NOTE: Sample water and buffer solution should have the same temperature.

In case sample water temperature deviates from the reference temperature of 77° F (25° C), calibrate the resp. value shown in the temperature table (see label on buffer solution).

There are two methods for pH calibration. The first adjusts the zero and the span settings for the pH range. The second calibration is an "offset," in which the pH sensor is exposed to a known pH solution and the displayed value is adjusted, up or down, to match the known value. This calibration can also be performed on the process water with the sensor in the flow cell. Verify that the pH of the process water has been accurately determined.

NOTE: The offset calibration is typically all that is recommended to calibrate pH when first starting the unit or replacing the sensor. The Depolox® 3 *plus* zero and span values are factory set in order to properly work with the sensor. Complete the zero and span calibrations, if there is a problem, only after completing the offset calibration.

- pH OFFSET Calibration

  a. With sensor in flow block, test sample pH.

  b. Press the **F** key until the "CALIBRATION" menu is displayed. Press the ▼ key until the "pH offset" menu is found.

  c. Press the ✓ key.

  d. Press ▼ or ▲ keys until the offset value is the difference of the displayed pH value compared to the manually measured value. Store this value using the ✓ key. (Example: For pH7 solution, the basic display reads 7.15pH. The offset value will be adjusted to -0.15 because the value is to come down from 7.15pH to 7.00pH.)

e. Return to the basic display by pressing the **ESC** key twice.

- pH Zero Calibration (Isothermal Intersection, pH7):

  a. Starting at the basic display press the **F** key until the "CALIBRATION" menu is displayed. Press the ▼ key until the "pH zero" menu is found.

  b. Withdraw the pH sensor. Fill 10 to 20 ml "pH7.00" buffer solution into a 100 ml beaker. Dip the sensor at least 20mm deep in the buffer solution pH7.00 and agitate lightly until the displayed pH value remains constant.

  c. Press the ✓ key.

  d. Press the ▼ or ▲ keys until the displayed value agrees with the value of the pH buffer solution. Store this value using the ✓ key.

- pH Span Calibration:

  a. Rinse the sensor in distilled water (in order to avoid spreading the buffer solution).

  b. Press the key ▼ until the "pH span" menu is reached.

  c. Pour 10 to 20ml pH4 or pH10 buffer solution into another beaker. Dip the pH sensor at least 20mm deep in the buffer solution and agitate lightly until the displayed pH value remains constant. (In case another buffer solution is used: the pH value of the buffer solution must be less than pH6 or greater than pH8.)

  d. Press the ✓ key to open the "pH Span" menu.

  e. Press keys ▼ or ▲ until the displayed value agrees with the value of the pH buffer solution. Store this value using the ✓ key. The measuring cell is now calibrated.

  f. Replace the sensor into the flow block.

  g. Dispose of the buffer solutions, rinse with enough water.

  h. Return to the basic display by pressing the **ESC** key twice or skip to fluoride calibration.

In case of error, both calibration points must be calibrated again.

3.2.4 Fluoride Calibration

NOTE: Fluoride measurement is optional.

WARNING: DO NOT CONTINUE TO USE BUFFER SOLUTIONS AFTER USE-BY DATE. BUFFER SOLUTIONS WHICH HAVE BEEN OPENED CAN ONLY BE KEPT FOR A LIMITED PERIOD. READ THE LABEL ON THE BOTTLE.

NOTE: Sample water and buffer solution should have the same temperature.

In case sample water temperature deviates from the reference temperature of 77° F (25° C), calibrate the resp. value shown in the temperature table (see label on buffer solution).

There are two methods for fluoride calibration. The first adjusts the zero and the span settings for the fluoride range. The second calibration is an "offset," in which the fluoride sensor is exposed to a known fluoride concentration solution and the displayed value is adjusted, up or down, to match the known value. This calibration can also be performed on the process water with the sensor in the flow cell. Verify that the fluoride concentration of the process water has been accurately determined.

NOTE: The offset calibration is typically all that is recommended to calibrate fluoride when first starting the unit or replacing the sensor. The Depolox® 3 *plus* zero and span values are factory set in order to properly work with the sensor. Complete the zero and span calibrations, if there is a problem, only after completing the offset calibration.

- Fluoride OFFSET Calibration

  a. With sensor in flow block, test sample Fluoride residual.

  b. Press the **F** key until the "CALIBRATION" menu is displayed. Press the ▼ key until the "Fluoride offset" menu is found.

  c. Press the ✓ key.

  d. Press ▼ or ▲ keys until the offset value is the difference of the displayed fluoride value compared to the manually measured fluoride solution value. Store this value using the ✓ key. (Example: The flow is measured at 0.20 mg/l fluoride solution. The basic display reads 0.28 mg/l fluoride. The offset value will be adjusted

to "- 0.08 mg/l fluoride" because the value is to come down from 0.28 mg/l to 0.20 mg/l.)

e. Return to the basic display by pressing the **ESC** key twice.

- Calibration at 0.20 mg/l:

a. Starting at the basic display press the **F** key until the "CALIBRATION" menu is displayed. Press the ▼ key until the "Fluor zero" menu is found.

b. Withdraw the fluoride sensor. Fill 10 to 20 ml "0.20 mg/l" buffer solution into a 100 ml beaker. Dip the sensor at least 20mm deep in the buffer solution 0.20 mg/l and agitate lightly until the displayed value remains constant.

c. Press the ✓ key.

d. Press keys ▼ or ▲ until the displayed value agrees with the value of the buffer solution. Store this value using the ✓ key.

- Calibration at 2.00 mg/l:

a. Rinse the sensor in distilled water (in order to avoid spreading the buffer solution).

b. Press the key ▼ until the "Fluor span" menu is reached.

c. Fill 10 to 20ml "2.00 mg/l" buffer solution into another beaker. Dip the fluoride sensor at least 20mm deep in the buffer solution and agitate lightly until the displayed value remains constant.

d. Press the ✓ key to open the "Fluor Span" menu.

e. Press keys ▼ or ▲ until the displayed value agrees with the value of the buffer solution. Store this value using the ✓ key. The measuring cell is now calibrated.

f. Refit the sensor into the flow block.

g. Dispose of the buffer solutions, rinse with enough water.

h. Return to the basic display by pressing the **ESC** key twice.

In case of error both calibration points must be calibrated again.

3.2.5 Temperature Calibration

1. Starting from the basic display in the main menu select the “Calibration” menu.
2. Select the “Temperature” menu item

The “Calibr. temperature” window appears on the graphic display.

3. Select “Cal. temperature”.
4. Use the arrow keys to enter the correct value.
5. Press “Enter” key to confirm entry.

NOTE: °C or °F can be selected in the “Temp. unit” menu. In the “PT1000“ menu, the automatic temperature compensation with the multi-sensor can be switched on or off.

3.3 Free Chlorine (AAB5383 Bare Electrode) Sensor Kit

3.3.1 Start-Up of the Measuring Cell

a. Unscrew nut (2) and remove cover (3) (see Dwg. 50.560.000.010 in Section 5).

b. Hold electrode assembly together with electrolyte reservoir (4-11) at the cover (10) and pull it out of the cell block (13) without turning.

c. Remove felt ring (transport protection of the membrane, 6)

d. Exchange plug (4) with separately supplied plug fitted with membrane for venting the electrolyte reservoir.

e. Place electrode assembly with electrolyte reservoir back into the cell block. Keying pin in the electrode assembly must snap into position.

f. Fill a half capful of grit (U-95653) into the cell block.

g. Place cover (3) and tighten by nut (2).

h. Allow sample water flow by opening the inlet valve(s).

i. After one hour the measuring signal has stabilized so far that a first calibration should be made as function test.

NOTE: For the first starting-up: After 24 hours of running time a further calibration is necessary. Air bubbles building up at the inner surface of the cell block and preventing somewhat the rotation of the grit will disappear after a running-in period of 24 to 48 hours.

3.3.2 Adjusting the Flow Regulator

The flow regulator is adjusted to a flow of 33 l/h (=0.55 l/min.). If necessary adjust the regulator as follows:

a. Remove the left or right hinge pin at the measuring cell and tilt the housing front to the side.

b. At the inner side of the front is the flow regulator. In the middle of the regulator is the adjusting screw. Turn the screw with a coin or a screwdriver (>10 mm). Turn to the right to reduce flow; turn to the left to increase flow.

c. Check flow and reassemble.

d. Perform calibration.

3.3.3 Free Chlorine (AAC6208 Bare Electrode) Flow Block Assemby

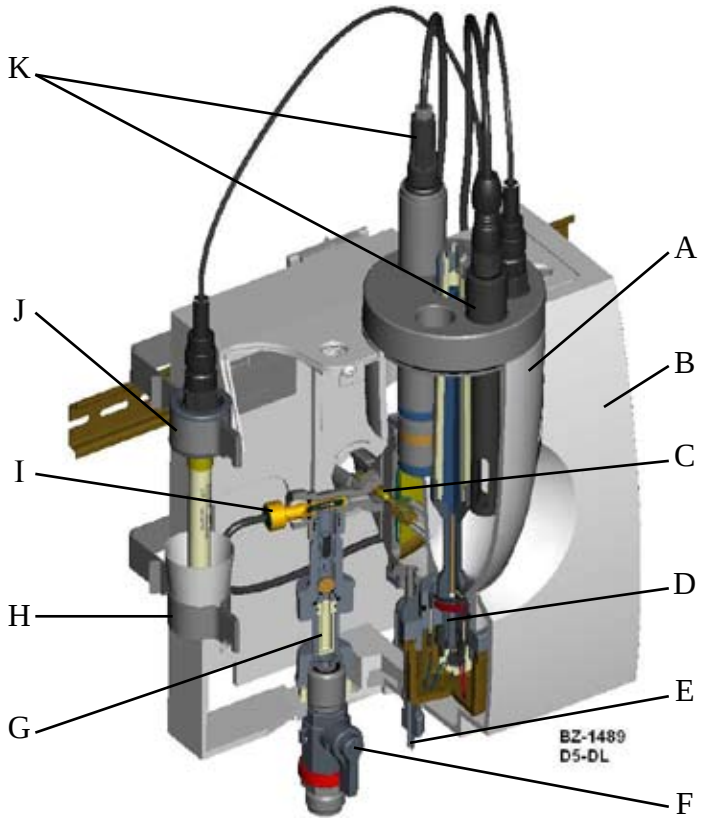
The AAC6208 flow block assembly contains the following:

- Cell body with cover
- Flow control valve
- 3 electrode cell for Cl_2, ClO_2, O_3, or $KMnO_4$
- Multi-sensor
- Drain
- Fine filter (For use only when membrane sensors are used.)
- Sample water inlet with check valve and ball valve

Two clips are installed in the housing cover. These are used to facilitate pH and fluoride calibration. Insert these clips into the rear panel of the housing. Insert one clip into the upper catch to attach the sensor. Insert the second clip into the center catch inorder to measure the buffer or calibration solution using the plastic cups provided.

The cell body can be equipped with up to five sensors.

A	Cell body with cover
B	Plastic housing
C	Flow control valve
D	3 electrode cell for Cl_2, ClO_2, O_3 or $KMnO_4$
E	Drain
F	Ball valve
G	Fine filter
H	Lower clip and cup
I	Multi-sensor
J	Upper clip
K	Sensors



3.3.4 Adding Grit (AAC6208 Bare Electrode)

1. Remove the protection plugs on the cell body cover of the Depolox® 5 flow block.

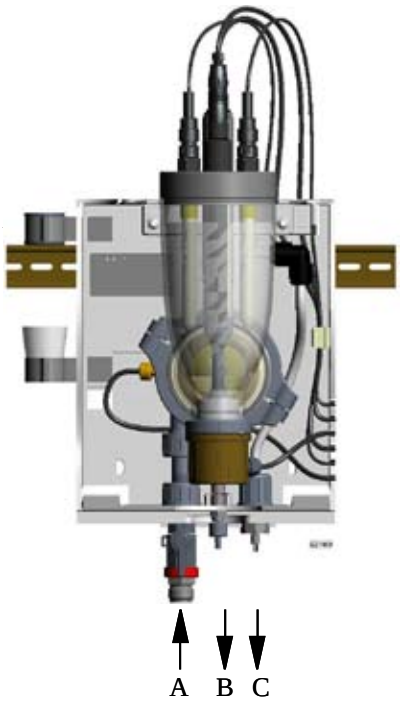
2. Fill half a cap from the plastic bottle with grit and pour it into the cell body (approx. 1/2 cm³ grit).

3. Replace the protection plugs on the cell body cover of the Depolox® 5 flow block.

NOTE: Make sure that the opening is clean; rinse off with distilled water, if necessary.

NOTE: The system must be recalibrated approx. 4 hours after each time the grit is replaced. The calibration must be checked after one day.

3.3.5 Connecting the Sample Water (AAC6208 Bare Electrode and AAD4165 VariaSens™ Flow Block)



A	Sample water inlet with ball valve
B	Drain on the drain screw
C	Sample water outlet

Connecting the sample water inlet:

1. Never use copper tubing.
2. The pressure in the sample water inlet must always be within a range of min. 3 to max. 58 psi. At the same time, the pressure in the sample water inlet must generally be 3 psi higher than in the sample water outlet.

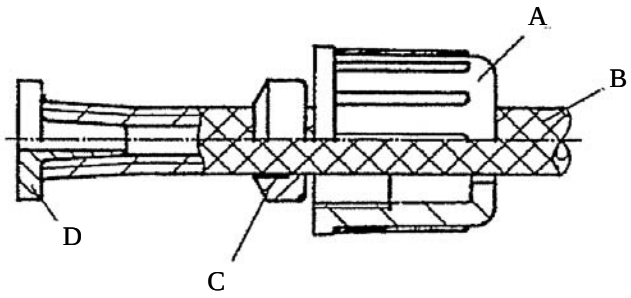
- If the preliminary pressure is below 3 psi, a pressure booster pump must be used.
- If the pressure exceeds 58 psi, a pressure reducing valve must be used.

3. To prevent long loop lag times, ensure that the pipes in the sample water inlet are as short as possible.
4. An external strainer with a mesh width of 0.02 inch is provided for the sample water inlet.

With hose connection:

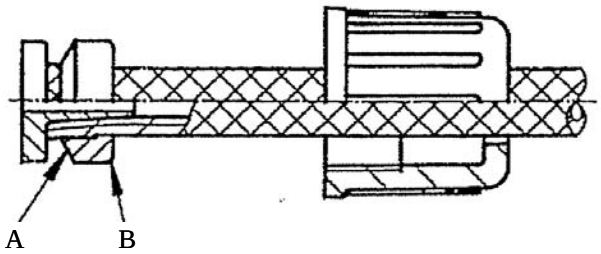
<u>NOTE:</u> The water-tightness of the hose screw connection is only guaranteed if the following installation instructions are followed!

1. Release the union nut (A) on the hose screw connection.
2. Insert the hose (B) until it hits the hose bushing (D).



A	Union nut
B	Hose
C	Locking ring
D	Hose bushing

3. Push the locking ring out until the union nut engages the connecting threads.



A	30° pitch on this side
B	Rounding on this side

Locking ring for PVC hose with 2 clamping points:
With rigid pipework:

1. Connect the sample water pipework to the ball valve connection threads.
2. Ensure that the sample water pipework is installed without mechanical stress.

Connecting the sample water outlet:

NOTE: Never use copper tubing.

1. No back-pressure is permitted in the cell body. The sample water outlet must be open.
2. The sample water outlet must be installed so that no siphon effect can occur.

<u>Recommendation:</u> Position the outlet above the drain line opening.

With hose connection:

See hose connection instructions described in sample water inlet connection.

With rigid pipework:

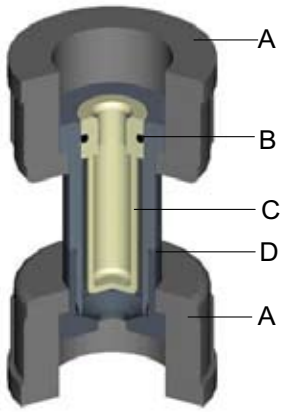
1. Connect the sample water pipework to the connection nozzle.
2. Ensure that the sample water pipework is installed without mechanical stress.

Connecting the drain:

1. Ensure that the drain screw is always closed.

3.3.6 Installing the Fine Filter

<u>NOTE:</u> A fine filter must only be installed when membrane sensors are employed. The fine filter (C) is included in the enclosed accessory set.



1. Release both knurled nuts (A).
2. Remove complete filter unit (D).
3. Place the fine filter (C) into the filter unit. Ensure that the O-ring (B) is seated correctly in the groove on the fine filter.
4. Reinstall the complete filter unit (D). Ensure that it is seated in the correct position.
5. Retighten both knurled nuts (A).

3.3.7 Bare Electrode Theory of Operation

The free chlorine that is measured in water for disinfection purposes comes in three forms. Free chlorine consists of elemental chlorine (Cl_2), hypochlorous acid (HClO), and hypochlorite ions (CIO-).

Hypochlorous acid is found in the acidic to neutral pH range undissociated in water. Only when the pH value rises does it break down into H+ and ClO- ions.

To understand the mode of functioning of chlorine as a disinfectant, it is necessary to know the chemical reactions that take place when water is chlorinated. Firstly there is the hydrolysis of the chlorine. This is the reaction of the chlorine with water. When chlorine gas is dissolved in water the formation of hypochlorous acid and hydrochloric acid results. All other disinfectants based on chlorine also react with water and form hypochlorous acid. The hypochlorous acid is the active substance for the disinfection process. Figure 3.6 shows the dependence of the form of chlorine on the pH value of the water. With rising pH value, the share of hypochlorous acid decreases by dissociating to form H3O+ and ClO-. In other words, the hypochlorous acid needed as the active substance in disinfection becomes less with increasing pH value while the share of ClO- ions that are meaningless for disinfection rises.

The Free Chlorine (Bare Electrode) measuring cell consists of a three-electrode system with external potentiostatic closed-loop control. The working electrode and the counter electrode of the half-ring type are made of a platinum alloy. A silver/silver-chloride electrode serves as reference electrode; the contact between reference electrode and sample water is established by two membranes. The reference electrode is mounted in PVC brackets and completely submerged in electrolyte.

The electrolyte container is transparent, thus enabling a visual check to be made of the amount of electrolyte in the reservoir. Replenishment of the electrolyte is possible without shutting down the measuring cell system. A membrane in the plug of the electrolyte reservoir provides the necessary equalization of pressure.

The measuring cell is connected to a digital measuring amplifier which maintains an adjustable constant potential (Upot) between working and reference electrodes by means of potentiostatic closed-loop control.

About 33 l/hr of the water to be analyzed flows past this system of electrodes. The current generated in the measuring cell is directly proportional to the concentration of the oxidizing agent in the sample water. This current is

then passed to the microprocessor-based electronic system Depolox® 3 *plus* for processing. A flow switch gives a signal to the Depolox® 3 *plus* if the flow is reduced (optional).

The surfaces of the electrodes are continuously cleaned by a special kind of cleaning grit in the electrode cell. The transparent plexiglass body of the cell makes it possible to observe the circulation of the grit in the cell.

If a double input electronics is used, a pH-value measurement will be inserted into the hole in the removable cover of the measuring cell. With the pH valve, used in conjunction with the chlorine measurement, it is possible to correct for variations caused by shifting pH.

The following features ensure accurate, repeatable measured data and reduce the frequency of zero point recalibration:

- potentiostatic control
- continuous hydromechanical electrode cleaning system
- regulated sample water flow.

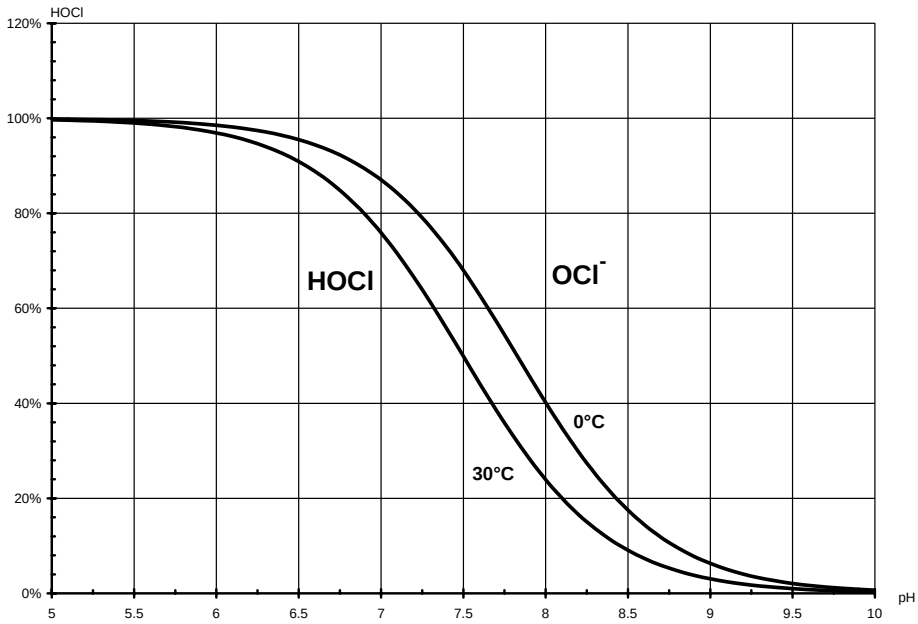


Figure 3.6 - Dissociation characteristics of HOCl and ClO- with pH value and showing effects of temperature

3.4 Membrane Sensor Kits

3.4.1 Start-Up the Flow Block Assembly

On completion of plant installation by trained, qualified personnel and prior to start-up, check that the sample water pipeline is securely connected and tested for leakage and that the sensor(s) are in place.

a. Open the sample water supply.

b. Check that the sample water stream directly points to the membrane of the Membrane sensor, if necessary turn the cover of the flow block assembly. Do not tolerate any air bubbles at the membrane of the sensor.

Start the Depolox® 3 *plus* module as described in paragraph 2.1.8, Start-Up.

3.4.2 System Shut-Down

- To switch-off the system for the short term:

  Switch off the electrical supply and close the sample water shut-off valve.

- To switch-off the system for the long term, for repairs, etc.:

  a. Switch off the entire system and isolate from the electrical supply

  b. Close the water shut-off valve on the flow block inlet

  c. Allow water to drain from the flow block.

  d. Remove one sensor after the other from the flow block.

  e. Clean the sensors and store them as described below.

  f. Cover the holes in the cover of the flow block with the protective caps.

  To re-start the system, refer to paragraph 2.3, Membrane Sensor.

- To store the sensors after use:

Remove the elastomer seal from the vent hole. Unscrew the membrane cap. Rinse the membrane and the reference electrode with distilled water. Carefully dry the reference electrode with a paper towel. Let the cap dry in a dust free place. Screw the dry membrane cap loosely onto the sensor. The membrane must not touch the gold working electrode.

3.4.3 VariaSens™ (AAD4165) Flow Block Assembly

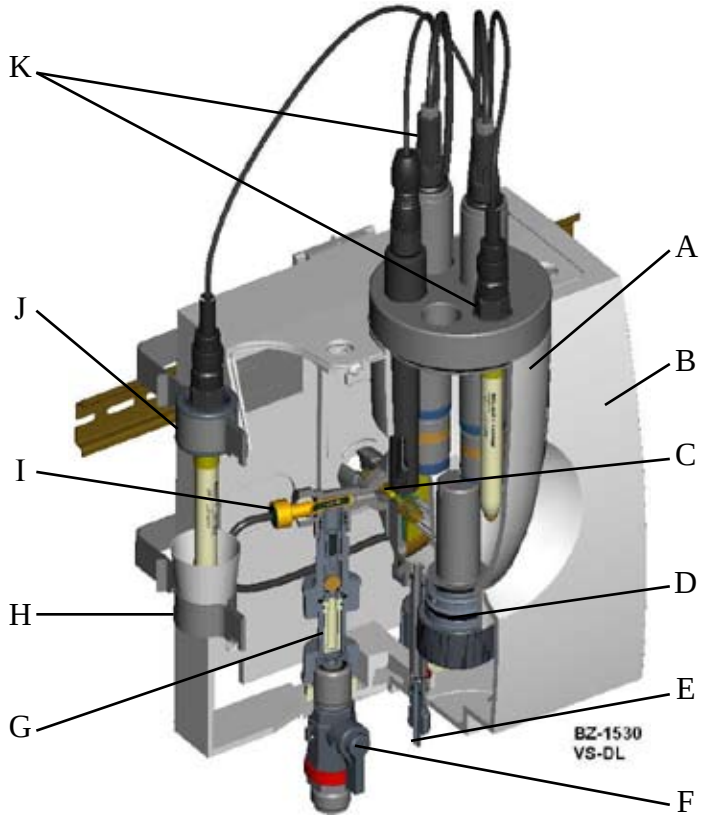
The VariaSens™ flow block assembly contains the following:

- Cell body with cover
- Flow control valve
- Multi-sensor
- Drain
- Fine filter (For use only when membrane sensors are used.)
- Sample water inlet with check valve and ball valve

Two clips are installed in the housing cover. These are used to facilitate pH and fluoride calibration. Insert these clips into the rear panel of the housing. Insert one clip into the upper catch to attach the sensor. Insert the second clip into the center catch inorder to measure the buffer or calibration solution using the plastic cups provided.

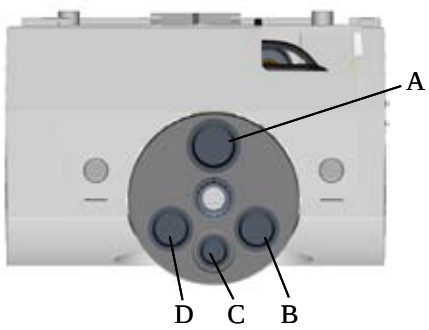
The cell body can be equipped with up to five sensors.

A	Cell body with cover
B	Plastic housing
C	Flow control valve
D	Drain
E	Ball valve
F	Fine filter
G	Lower clip and cup
H	Multi-sensor
I	Upper clip
J	Sensors

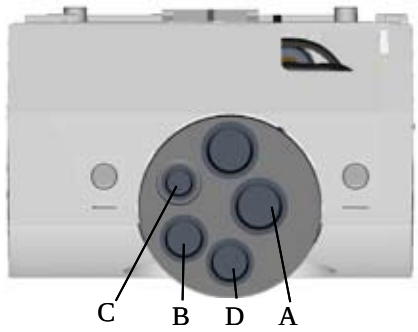


3.4.4 Insert the Sensors and Connect

Arrangement of the sensors:



AAC6208 Bare Electrode



AAD4165 VariaSens™

A	Membrane sensor: FC1, CD7, OZ7, TC1
B, C, D	Fluoride / pH

1. Remove the protection caps from the sensors.
2. Install sensors (see figure above) in the cell body cover.

The sensors are marked as follows:

Membrane sensor for free chlorine, chlorine dioxide, ozone and total chlorine (A)
pH: Sensor for fluoride or pH value, marked "F-" or "pH" (B, C, D)

Keep the dust protection caps and watering caps of the sensors for subsequent use.

Cable extension:
The sensor cable for free chlorine and total chlorine may be extended to a max. of 50 m.

If the pH or fluoride sensor cables must be extended (max. 50 m), an impedance converter must be attached to the sensor. The impedance converter converts the very high-resistance sensor signal into a low-resistance signal. The impedance converter is supplied by an installed battery. The life of the battery is approx. 5 years; the impedance converter should be sent to the factory for battery replacement.

3.4.5 Decommissioning

CAUTION: Danger of uncontrolled dosing of chlorine or pH correction medium: Shut down dosing system, close positioner!

If the installation site of the flow block assembly is not frost-free, the system must be shut down prior to any possible frost formation.

1. Switch off the power supply.
2. Drain the sample water supply line and drainage line (hold container underneath)
3. Empty cell bodies and remove grit.
4. Dismantle the filter housing and the check valve housing.
5. When the remaining water has drained from the flow control valve, refit the filter housing and the check valve housing.
6. Remove the sensors from the cell body cover and disconnect from the cable (see section 2.3 "Membrane sensors").
7. Apply a KCI solution to the protection caps of the pH electrodes and fit onto the electrodes.

   The fluoride electrodes can be stored wet in the short term in a 100 mg/l fluoride solution at pH 7. Fill the electrodes in the tank with 100 mg/l fluoride solution and mount on the electrodes. However, the electrodes should be stored in a dry condition if they are to be warehoused for several months. In this case, drain the fill solution

from the electrode chamber and wash the membrane and chamber with distilled water.

8. Store the sensors in a frost-free place.

   The water must be drained if frost occurs.

   Insert electrode in a beaker with water or electrolyte and store in a frost-free
   place.

9. Procedure for membrane sensors, see section 2.3 “Membrane sensors”.

   “Storing the membrane sensor for free chlorine FC1”
   “Storing the membrane sensor for chlorine dioxide CD7”
   “Storing the membrane sensor for ozone OZ7”
   “Storing the membrane sensor for total chlorine TC1”

3.4.6 Membrane Sensor Theory of Operation

The Membrane Sensor Kit consists of a flow through cell with a transparent Plexi-glass body that houses the chlorine sensors (and optionally the pH or the fluoride sensor). The cell’s transparency permits visual checks on the flow of sample water and measuring conditions.

The Membrane Sensor measures the sum of free chlorine and chloramines. The Sensor includes a membrane-covered potentiostatic 3 electrode system. The silver/silver-iodide reference electrode and gold working electrode are positioned inside the membrane cap filled with a potassium iodide electrolyte solution. The stainless steel counter electrode is located outside the membrane cap for added stability. Chlorine, diffusing through the membrane, causes a reaction at the working electrode, creating a current, which is a direct measure of Total Chlorine. An amplifier in the electrode shaft conditions this signal including temperature compensation and passes it to the microprocessor-based electronic system Depolox® 3 *plus* for processing.

Air bubbles on the membrane may prevent chlorine from passing through the membrane, resulting in a false reading of the probe. A water jet, designed into the flow block assembly, is used to remove any potential air bubbles from the membrane.

The sensor has a very low dependence on pH-value, so you can use it in water with varying pH-value. The sensor should be used only in potable water applications.

The sensor is designed such that a zero residual chlorine will yield zero current. Therefore only a single point calibration is needed.

The flow block assembly, housing the Membrane Sensor, is designed to provide a constant flow of water past the membrane surface. This and the potentiostatic three-electrode system ensure accurate and repeatable measured data.

- **FC1, OZ7, CD7:** The FC1 for Free Chlorine, the OZ7 for Ozone, and the CD7 for Chlorine Dioxide all work similarly, however, they utilize a silver/silver chloride reference electrode, a different electrolyte, and a different membrane to allow for the selectivity required for the different measurands.

3.4.6.1 Membrane Sensor for Free Chlorine FC1

The FC1 membrane sensor is a special sensor for measuring the concentration of free chlorine in water. The sensor incorporates a pH buffer in the electrolyte and is suitable for water with various pH values. The sensor may only be used in clear water of potable water quality.

CAUTION: The electrode fingers (reference electrodes) and membrane are extremely sensitive! Do not touch, soil or damage! Before unscrewing the filled membrane cap, push the elastomer seal to one side to permit the inflow of air through the vent underneath it! Otherwise, the membrane may be damaged due to developing negative pressure. Do not sand down the light yellowish-gray deposit of the electrode finger or wipe it in the direction of the gold working electrode! The electrolyte may spray out of the valve opening. Flush eyes and skin immediately with water after contact. Rinse away spilled electrolyte with water. The electrolyte contains potassium halide and is acidic.

Commissioning the Membrane Sensor for Free Chlorine FC1

1. Unscrew the membrane cap from the electrode shaft.
2. Place the membrane cap and the G-holder on a clean, non-absorbent pad and fill both with the included electrolyte bubble-free up to the top thread on the inside of the cap.
3. Rub gold working electrode with the included lapping paper (special emery). To do this, lay the lapping paper on a paper towel, take hold of the corner and while holding the measuring cell vertically (without G-holder), slide the electrode end two to three times over the rough side of the lapping paper.

4. Check whether the elastomer seal completely closes the valve opening.
5. Hold the electrode shaft vertically and carefully push the electrode finger into the filled G-holder.

6. Then place the electrode shaft on the filled membrane cap and slowly screw the membrane cap in place by hand.

<u>CAUTION:</u> Because excess electrolyte escapes through the valve opening, do not clamp it shut and do not press on the elastomer seal.

7. Rinse away the escaped electrolyte with water.

<u>NOTE:</u> The membrane cap must be completely screwed onto the electrode shaft so that there is no gap between the two! After approximately one hour, the membrane sensor is sufficiently run in so that it can be initially calibrated. The calibration must be repeated after approx. one day.

Inserting the Membrane Sensor for Free Chlorine FC1 Into the Flow-Through Adapter

1. Push the sensor through the cover into the flow-through adapter until it touches the inflow mating connector. It may be necessary to position the flow-through adapter cover correctly by turning it.

NOTE: Remove air bubbles from the surface of the membrane, bubbles on the membrane will interfere with the measurement!

2. Connect the measuring signal cable to the FC1.

Storing the Membrane Sensor for Free Chlorine FC1

1. Lift elastomer seal and unscrew membrane cap.
2. Remove G-holder (with tweezers, if necessary) and rinse together with the membrane cap and electrode finger with clean (distilled) water. Leave in a dust-free place to dry.
3. Then loosely screw the dry membrane cap onto the electrode shaft (place G-holder loosely into the membrane cap; not attached to electrode finger).

NOTE: The membrane may not touch the gold working electrode.

Restarting: Refer to "Commissioning the membrane sensor for free chlorine FC1".

Error in Membrane Sensor for Free Chlorine FC1

Trouble-shoot and debug if the measuring signal is too low or irregular:

1. Remove air bubbles on the membrane (e.g. tap the inflow mating connector); air bubbles prevent the chlorine from diffusing through the membrane and distort the measurement.

NOTE: Air bubbles on the remaining parts of the sensor are normal after initial commissioning or restarting; they evaporate after one or two days.

2. Replenish electrolyte.
3. Open membrane sensor. To do this, push the elastomer seal to one side to permit the inflow of air and unscrew the membrane cap.

CAUTION: Do not unscrew the membrane holder from the mem brane cap under any circumstances!

4. As a rule, the G-holder remains in the membrane cap.
5. Pour out the electrolyte.
6. Wash the electrode finger with clean (distilled) water and allow it to air dry.
7. Rub gold working electrode with the included lapping paper (special emery). To do this, lay the lapping paper on a paper towel, take hold of the corner and while holding the measuring cell vertically, slide the electrode end two to three times over the rough side of the lapping paper.

For further procedure, see "Commissioning the membrane sensor for free chlorine FC1". If the sensor's measuring signal is still too low or irregular, a new membrane cap must be used. The measuring cell requires one to two hours before it can be calibrated.

3.4.6.2 Membrane Sensor for Chlorine Dioxide CD7

The CD7 membrane sensor enables the chlorine dioxide content in all types of water to be determined selectively, without cross-sensitivity to chlorine, bromine and hydrogen peroxide, however, with cross-sensitivity to ozone and peracetic acid. The sensor does not demonstrate a pH value dependency and is therefore very suitable for water with various pH values.

CAUTION: The electrode fingers (reference electrodes) and membrane are extremely sensitive! Do not touch, soil or damage! Before unscrewing the filled membrane cap, push the elastomer seal to one side to permit the inflow of air through the vent underneath it! Otherwise, the membrane may be damaged due to developing negative pressure. Do not sand down the light yellowish-gray deposit of the electrode finger or wipe it in the direction of the gold working electrode!

Commissioning the Membranesensor for Chlorine Dioxide CD7

1. Screw off the membrane cap from the electrode shaft and fill with the included gel electrolyte.
2. Tap on the membrane cap with the electrode shaft until air bubbles are removed.

3. Rub gold working electrode with the included lapping paper (special emery). To do this, lay the lapping paper on a paper towel, take hold of the corner and while holding the measuring cell vertically, slide the electrode end one to two times over the rough side of the lapping paper.

4. Check whether the elastomer seal completely closes the valve opening.
5. Then place the electrode shaft on the filled membrane cap and slowly screw the membrane cap in place by hand.

NOTE: Because excess electrolyte escapes through the hose valve, do not clamp it shut and do not press on the elastomer seal.

6. Rinse way the escaped electrolyte with water.

NOTE: The membrane cap must be completely screwed onto the electrode shaft so that there is no gap between the two! After approximately two hours, the membrane sensor is sufficiently run in so that it can be initially calibrated. The calibration must be repeated after approx. one day.

Inserting the Membrane Sensor for Chlorine Dioxide CD7 Into the Flow-Through Adapter

1. Push the sensor through the cover into the flow-through adapter until it touches the inflow mating connector. It may be necessary to position the flow-through adapter cover correctly by turning it.

NOTE: Remove air bubbles from the surface on the membrane, bubbles on the membrane will interfere with the measurement!

2. Connect the measuring signal cable to the CD7.

Storing the Membrane Sensor for Chlorine Dioxide CD7

1. Lift elastomer seal and unscrew membrane cap.
2. Wash the membrane cap and electrode finger with clean (distilled) water.
3. Leave the electrode finger to dry in a dust-free place.
4. Leave the cap to dry in a dust-free place.
5. Then screw the dry membrane cap loosely onto the electrode shaft.

CAUTION: The membrane may not touch the gold working electrode.

Restarting: Refer to "Commissioning the membranesensor for chlorine dioxide CD7".

Error in Membrane Sensor for Chlorine Dioxide CD7

Trouble-shoot and debug if the measuring signal is too low or irregular:

1. Remove air bubbles on the membrane (e.g. tap the inflow mating connector); air bubbles prevent the chlorine dioxide from diffusing through the membrane and distort the measurement.

NOTE: Air bubbles on the remaining parts of the sensor are normal after initial commissioning or restarting; they disapate after one or two days.

2. Replenish electrolyte.
3. Open membrane sensor. To do this, push the elastomer seal to one side to permit the inflow of air and unscrew the membrane cap.
4. Pour out the electrolyte.
5. Wash the electrode finger and the membrane cap with clean (distilled) water and allow it to air dry.

For further procedure, see "Commissioning the membranesensor for chlorine dioxide CD7".

If the sensor's measuring signal is still too low or irregular, a new membrane cap must be used. The measuring cell requires one to two hours before it can be calibrated.

3.4.6.3 Membrane Sensor for Ozone OZ7

The OZ7 membrane sensor enables the ozone content in all types of water to be determined selectively, without cross-sensitivity to chlorine, bromine and hydrogen peroxide, however, with cross-sensitivity to chlorine dioxide and peracetic acid. The sensor does not demonstrate a pH value dependency and is therefore very suitable for water with various pH values.

CAUTION: The electrode fingers (reference electrodes) and membrane are extremely sensitive! Do not touch, soil or damage! Before unscrewing the filled membrane cap, push the elastomer seal to one side to permit the inflow of air through the vent underneath it! Otherwise, the membrane may be damaged due to developing negative pressure. Do not sand down the light yellowish-gray deposit of the electrode finger or wipe it in the direction of the gold working electrode!

Commissioning the Membrane Sensor for Ozone OZ7

CAUTION: When unscrewing the filled membrane cap, both elastomer seals lying one on top of the other above the type imprint must be pushed to the side to allow air to flow into the electrolyte chamber, otherwise the membrane will be destroyed due to developing negative pressure.

1. Remove the black insulating tube from the electrode finger.
2. Open the container with the membrane cap, empty out the water and remove the membrane cap.
3. Fill the membrane cap up to the top of the threads inside the cap with the included gel electrolyte.

NOTE: Ensure that only one elastomer seal is in the slot and that the valve opening closes.

4. Rub gold working electrode with the included lapping paper (special emery). To do this, lay the lapping paper on a paper towel, take hold of the corner and while holding the measuring cell vertically, slide the electrode end one to two times over the rough side of the lapping paper.

5. Then place the electrode shaft on the filled membrane cap and slowly screw the membrane cap in place by hand.

NOTE: Because the excess electrolyte escapes through the hose valve, do not clamp it shut.

6. Then push the second elastomer seal in the slot over the first one.

NOTE: The elastomer seals may not form creases.

7. Rinse away the escaped electrolyte with water.

NOTE: The membrane cap must be completely screwed onto the electrode shaft so that there is no gap between the two! After approximately two hours, the membrane sensor is sufficiently run in so that it can be initially calibrated. The calibration must be repeated after approx. one day.

Inserting the Membrane Sensor for Ozone OZ7 into the Flow-Through Adapter

1. Push the sensor through the cover into the flow-through adapter until it touches the inflow mating connector. It may be necessary to position the flow-through adapter cover correctly by turning it.

NOTE: Remove air bubbles from the surface of the membrane, bubbles on the membrane will interfere with the measurement!

2. Connect the measuring signal cable to the OZ7.

Storing the Membrane Sensor for Ozone OZ7

1. Lift elastomer seal and unscrew membrane cap.
2. Wash the membrane cap and electrode finger with clean (distilled) water.

3. Allow the electrode finger and the cap to dry in a dust-free place.
4. Then screw the dry membrane cap loosely onto the electrode shaft.

NOTE: Ensure that the membrane never touches the measuring electrode.

Restarting: Refer to "Commissioning the membrane sensor for ozone OZ7".

Error in Membrane Sensor for Ozone OZ7

Trouble-shoot and debug if the output signal is too low or irregular:

1. Remove air bubbles on the membrane (e.g. tap the inflow mating connector); air bubbles prevent the ozone from diffusing through the membrane and distort the measurement.

NOTE: Air bubbles on the remaining parts of the sensor are normal after initial commissioning or restarting; they disapate after one or two days.

2. Replenish electrolyte.
3. Open membrane sensor. To do this, push the elastomer seal to one side to permit the inflow of air and unscrew the membrane cap. Pour out the electrolyte.
4. Wash the electrode finger and the membrane cap with clean (distilled) water and allow to air dry.

For further procedure, see "Commissioning the membrane sensor for ozone OZ7".

If the sensor's measuring signal is still too low or irregular, a new membrane cap must be used. The measuring cell requires one to two hours before it can be calibrated.

3.4.6.4 Membrane Sensor for Total Chlorine TC1

The membrane sensor measures the total amount of free and combined chlorine (chloramine). The sensor incorporates a pH buffer in the electrolyte and is suitable for water with various pH values. The sensor may only be used in clear water of potable water quality.

CAUTION: The electrode fingers (reference electrodes) and membrane are extremely sensitive! Do not touch, soil or damage! Before unscrewing the filled membrane cap, push the elastomer seal to one side to permit the inflow of air through the vent underneath it! Otherwise, the membrane may be damaged due to developing negative pressure. Do not sand down the light yellowish-gray deposit of the electrode finger or wipe it in the direction of the gold working electrode!

Commissioning the Membrane sensor for Total Chlorine TC1

1. Screw off the membrane cap from the electrode shaft and fill to the top of the threads on inside of cap with the included gel electrolyte.
2. Rub gold working electrode with the included lapping paper (special emery). To do this, lay the lapping paper on a paper towel, take hold of the corner and while holding the measuring cell vertically, slide the electrode end one to two times over the rough side of the lapping paper.

3. Check whether the elastomer seal completely closes the valve opening.
4. Then place the electrode shaft on the filled membrane cap and slowly screw the membrane cap in place by hand.

NOTE: Because excess electrolyte escapes through the hose valve, do not clamp it shut and do not press on the elastomer seal.

5. Rinse away the escaped electrolyte with water.

NOTE: The membrane cap must be completely screwed (hand-tight) onto the electrode shaft so that there is no gap between the two! After approximately one hour, the membrane sensor is sufficiently run in so that it can be initially aligned. The alignment must be repeated after one day.

Inserting the Membrane Sensor for Total Chlorine TC1 Into the Flow-Through Adapter

1. Push the sensor through the cover into the flow-through adapter

until it touches the inflow mating connector.It may be necessary to position the flow-through adapter cover correctly by turning it.

NOTE: Remove air bubbles from the surface of the membrane, bubbles on the membrane will interfere with the measurement!

2. Connect the measuring signal cable to the measuring device.

Storing the Membrane Sensor for Total Chlorine TC1

1. Lift elastomer seal and unscrew membrane cap.
2. Wash the membrane cap and electrode finger with clean (distilled) water. Allow the electrode finger to air dry.
3. Leave the cap to dry in a dust-free place.
4. Then screw the dry membrane cap loosely onto the electrode shaft.

CAUTION: The membrane may not touch the gold working electrode.

Restarting: Refer to "Commissioning the membranesensor for total chlorine TC1".

5. Store the conductivity sensor in a dry place.
6. To restart, follow the instructions to start up the corresponding sensors.

Error in Membrane Sensor for Total Chlorine TC1

Trouble-shoot and debug if the measuring signal is too low or irregular:

1. Remove air bubbles on the membrane (e.g. tap the inflow mating connector); air bubbles prevent the chlorine from diffusing through the membrane and distort the measurement.

NOTE: Air bubbles on the remaining parts of the sensor are

normal after initial commissioning or restarting; they disapate after one or two days.

2. Replenish electrolyte.
3. Open membrane sensor. To do this, push the elastomer seal to one side to permit the inflow of air and unscrew the membrane cap.
4. Pour out the electrolyte.
5. Wash the electrode finger and the membrane cap with clean (distilled) water and allow to dry in a dust-free place.

For further procedure, see "Commissioning the membrane sensor for total chlorine TC1".

If the sensor's measuring signal is still too low or irregular, a new membrane cap must be used. Thereafter, the measuring cell requires one to two hours before it can be calibrated.

WARNING: DO NOT TOUCH THE REFERENCE ELECTRODE! BEFORE UNSCREWING THE MEMBRANE CAP, REMOVE THE ELASTOMER SEAL TO ALLOW AIR INTO THE VENT HOLE. NOT DOING THIS WILL CAUSE A VACUUM TO OCCUR WHICH WILL DAMAGE THE MEMBRANE WHEN UNSCREWING THE CAP. DO NOT REMOVE THE YELLOW-GREY LAYER ON THE REFERENCE ELECTRODE.

NOTE: It is important that the membrane is in the direct sample water flow. Because of this the flow-through assembly has a special form where the sensor fits in.

3.5 pH Sensor Kit

3.5.1 Description

The Wallace & Tiernan® pH sensor has a ceramic diaphragm and a silver/silver-chloride reference electrode. The 3.0 mol KCl gel electrolyte does not require replenishment.

To protect the sensitive measuring membrane the sensor is shipped with a protection cap over its glass tip. This cap contains 3 mol KCl solution to keep the sensor in a constant state of readiness. Leave the cap in place on the sensor until it is about to be installed. Do not discard the cap but keep it and use it to protect the sensor whenever it is removed from service. Then fill the cap with water (not distilled) and place it over the tip of sensor.

The pH sensor has a threaded plug-in head. Care must be taken to ensure that the O-ring is present when connecting the head. A standard 1.5 m long, shielded coaxial (measuring) cable is supplied with the pH sensor. At one end the cable has a special plug which is screwed on to the threaded plug-in head of the sensor. The other end of the shielded special cable is connected directly to the intended terminal connection in the PCS control module.

3.6 Fluoride Sensor Kit

3.6.1 Description

The fluoride sensor is equipped with a rubber cap over the fluoride sensitive membrane. Lift the cap before placing the electrode into the sample water.

NOTE: Do not touch or scratch the membrane, the electrode could be damaged.

If the sensor is not used for a long period of time, place the cap again on the electrode with some reference electrode filling solution in it.

As a standard, a shielded coax cable, 1.5 m long, is supplied together with the sensor.

3.6.2 Preparation of the Electrode

See instructions included with sensor.

3.7 RS485 Interface

3.7.1 Printer Facility

The Depolox® 3 *plus* is not able to send data directly to a printer.

3.7.2 Description of the RS485 Bus Interface

The serial RS485 bus interface of the Depolox® 3 *plus*, built-in as a standard, is used for data transmission to a PC, to an external plant control or to the MF485 interface card (e.g., for connection to a printer).

The serial RS485 bus interface of the Depolox® 3 *plus* is designed as a symmetrical two-wires bus line to EIA RS 485 (DIN 66259 part 4 resp. ISO 8482), that enables data transfer with high transfer rate (19.2 KBaud) and long distances (up to 1200 m).

Characteristics:

- Data transfer in both directions
- twin wire connection (half duplex)
- Bus structure (addressable interface, up to 32 bus users)

The interface works with differential voltage signals, ensuring high interference susceptibility.

The bus system consists of a maximum of 32 passive users and one active user. Only the active user (computer system) is entitled to start communication. The Depolox® 3 *plus* is always a passive user.

3.7.2.1 Cable

A shielded and twisted two-wire cable (twisted pair) is to be used. The shield improves the electromagnetic compatibility. An unshielded cable can be used if acceptable within the surroundings, that means, if no electromagnetic interferences are expected.

The bus cable is connected from one user to the next. Stub cables of a maximum length of 0.3 m are allowed. The surge impedance of the cable should be between 100 and 130 ohm, the cable capacitance preferably <60 pF/m and the cross section 0.22 mm² (e.g., Li2CY(TP) 2x0.22 mm²). If using a shielded cable we recommend to connect the shield on both sides with low resistance (large cross sections and short cables) to protection ground, to have optimum interference compatibility.

3.7.2.2 Interface Connection

The bus cable for the communication with the Depolox® 3 *plus* should be connected to the following terminals:

Bus line A: Terminal 28
Bus line B: Terminal 27

<u>NOTE</u>: The RS485 interface of the Depolox® 3 *plus* is not galvanically isolated. Each Depolox® 3 *plus* occupies two bus addresses of its own (e.g., 0 for chlorine, 1 for pH or for fluoride). This means that in a bus system with Depolox® 3 *plus*-modules, each of the modules behaves as two separate bus users.

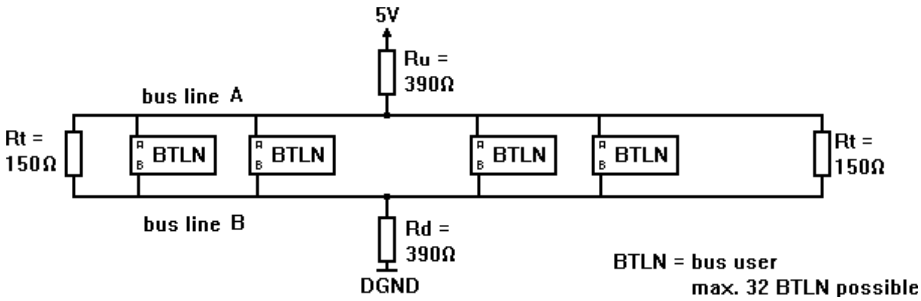


Figure 3.7 - Interface Connection

Both ends of the bus cable must be connected to a moving load Rt (150 Ohm). Symmetry is assured at only one point of the bus. With a voltage supply of 5 V, the resistors Rd and Ru (390 Ohm each) connect to ground and 5 V. These resistor values fit for transmission of up to 19200 Bit/s and a maximum bus length of 1200 m. Symmetry and bus ends should be executed in the same way at potentially isolated and non-isolated bus systems.

Resistors may be switched on via DIP switch in the terminals box. (See Figure 3.8.)

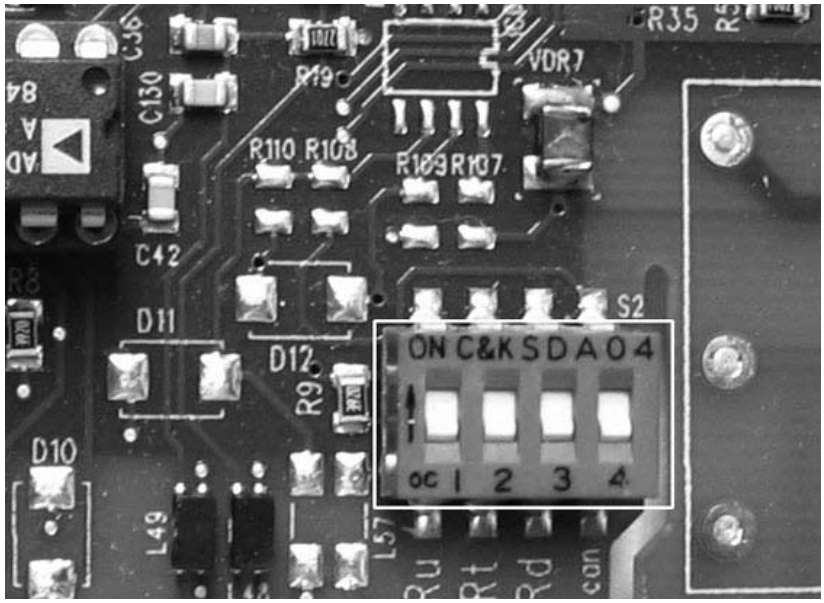


Figure 3.8 - Terminals Box

3.7.2.3 Bus Connection

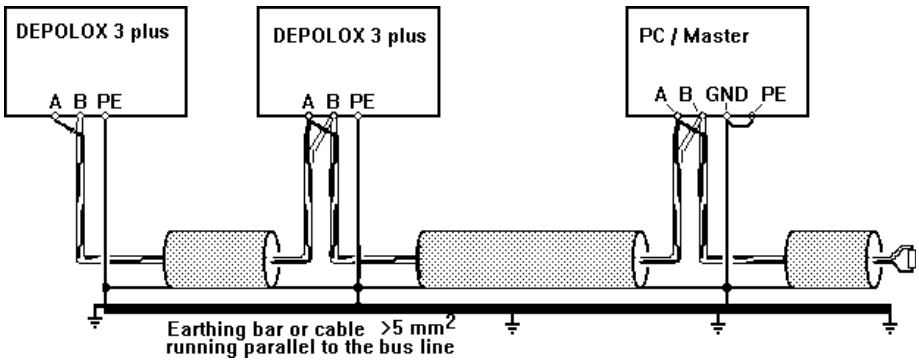


Figure 3.9 - Potentially Not Isolated RS485 Bus System

3.7.3 Specification of Bus Interface

1	Synchronization mode:	Asynchronous	
2	Transmission rate:	19200 Baud	
3	Data format (asynchronous):	- Start bit:	1 Bit
		- Data bit:	8 Bit
		- Parity bit:	even
		- Stop bit:	1 Bit
4	Signal polarity:	Differential voltage interface Logical “1” = (A-B >= 0.2V) Logical “0” = (A-B <= -0.2V)	
5	Handshake:	No handshake because of request control with fixed blocks	
6	Transmission code:	Siemens Water Technologies-Protocol (master-slave) multipoint communication, maximum 32 users	
7	Galvanically not isolated		

3.7.4 Transmission Protocol

For the communication between master (active user, e.g., computer) and slave (passive user), two different kinds of frames are used:

- Request - Frame
- Set - Frame

The slave answers to these frames with the following frames:

- Answer frame
- Positive confirmation
- Negative confirmation

The bytes of these frames always have the same formats:

- 1 Start bit (always “0”)
- 8 Data bits
- 1 Parity bit (even)
- 1 Stop bit (always “1”)

3.7.4.1 Description of the Bytes of the Frames

- Synchronization bytes: Used for the synchronization of the user units to the others.

- Start byte (SB): Marks the begin of a frame.

  The value depends on the type of the frame:

Request frame	10H
Set frame	68H
Answer frame	68H
Positive confirmation	A2H
Negative confirmation	DCH

- Slave address: To every module in the RS485 bus a special bus address is allocated (slave address). The address can be a number between 0 and 31 Dec.

NOTE: The Depolox® 3 *plus* module uses up to two bus addresses because of the two-fold function of the module (Cl_2 measurement, pH or fluoride measurement).

- Destination address: Determines the transmission variable in the address reference list, that is to be read or written.

- Check byte: Determines the type of information to be read from the slave. Also the data format is defined.

  Data format of the check byte (Bit 0 through 3):

Bit (3210)	Dez.	Format:
0000	0	Default (to address reference list)
0001	1	Default (to address reference list)
0010	2	Boolean
0011	3	Boolean
0100	4	unsigned Character
0101	5	signed Character
0110	6	unsigned Integer
0111	7	signed Integer
1000	8	unsigned long Integer
1001	9	signed long Integer
1010	10	Floating Point
1011	11	Floating Point
1100	12	ASCII
1101	13	ASCII
1110	14	Mixed data format
1111	15	Mixed data format

Additional functions of the check byte (Bit 4 through 7):

Bit (7654)	Function
1000	Minimum value of the variable
0100	Maximum value of the variable
0010	Default value of the variable
0001	additional information of the variable

If no bit is set in bits 5 through 7, the actual value is written or read. Otherwise the corresponding additional information is sent by the slave.

- Special case: With “negative confirmation,” the check byte includes an additional information about the error occurred. With “positive confirmation,” the check byte is set to 00Hex.

Value:	Function:
01H	End of address table
02H	Wrong data format
04H	Additional information not available
08H	Variable to set not within min. and max. limits
10H	reading access not permitted
20H	reading access permitted but wrong password
40H	writing access not permitted
80H	writing access permitted but wrong password
C0H	writing access not permitted (wrong operation mode)

- Number byte: Defines the number of bytes to read or to write.
- Frame Check: The sum of the control bytes of a frame is stored in the frame check.

  FC = (unsigned char) SB + SA + ZA + KB + AB
- Data unit: Includes data informations be sent by slave or master.
- Data check: The check sum of the data bytes of a frame is stored in the data check.

  CD = (unsigned char) sum of DU
- End byte: Marks the end of a frame. Value is always 16Hex.

3.7.4.2 Request - Frame

This is necessary to read data or additional information from a slave.

Format of the request frame:

Byte:	0-2	3	4	5	6	7	8	9
Name:	SYN	SB	SA	ZA	KB	AB	FC	EB

Byte:	Name:	occupied by:
0-2	SYN	Synchronization bytes
3	SB	Start byte 10H
4	SA	Slave address
5	ZA	destination address
6	KB	check byte
7	AB	number of bytes
8	FC	frame Check
9	EB	end byte 16H

With the request frame, single words, values covering more addresses, or additional information of the destination address can be read. If the contents of a single destination address are requested, the number byte is set to 00Hex. In the answer frame, the data format and the number of bytes are entered from the address reference list to the check byte and the number byte.

If a number byte is set in the request frame (request covering more addresses), the data format in the answer frame is set to 04Hex (unsigned char). The number byte of the answer frame receives the value of the

number byte of the request frame. A data format eventually entered in the request frame is ignored.

If the additional information of a destination address is requested, the check byte must include the identification for this additional information. The data format and the number byte are ignored. The check byte and the answer byte are set according to the reference list. Valid request frames are answered with an answer frame. Invalid request frames are answered with "negative confirmation."

Example: Requesting the contents of destination address 02H from slave 07H:

00H	00H	00H	10H	07H	02H	00H	00H	19H	16H
SYN		SB	SA	ZA	KB	AB	FC	EB	

3.7.4.3 Set - Frame

The set frame is used for writing data to a slave.

Format of the set frame:

Byte:	0-2	3	4	5	6	7	8	9-X	Y	Z
Name:	SYN	SB	SA	ZA	KB	AB	FC	DU	DC	EB

Byte:	Name:	Function:
0-2	SYN	Synchronization bytes
3	SB	Start byte 68H
4	SA	Slave address
5	ZA	Destination address
6	KB	Check byte
7	AB	Number byte
8	FC	Frame Check
9-X	DU	Data bytes
Y	DC	Data Check
Z	EB	End byte 16H

With the set frame, single words, values covering more addresses, or additional information can be written.

If the contents of a single destination address are written, the number byte must correspond to the number byte of the address reference list. The data format must be set to "default" or to the data format from the

address reference list.

If more variables are to be set covering more addresses, the data format must be set to "default." The number byte means the number of bytes to write; only whole variables have to be written. Valid set frames are answered with a "positive confirmation." Invalid set frames are answered with "negative confirmation."

Example: Setting the contents of destination address 02H of the slave 07H to 904 (Dec).

0H	00H	00H	68H	07H	02H	06H	02H	79H	03H	88H	8BH	16H
SYN		SB	SA	ZA	KB	AB	FC	DU			DC	EB

3.7.4.4 Answer - Frame

The answer frame is transmitted by the slave because of a request frame of the master.

Format of the answer frame:

Byte:	0-2	3	4	5	6	7	8	9-X	Y	Z
Name:	SYN	SB	SA	ZA	KB	AB	FC	DU	DC	EB

Byte:	Name:	Function:
0-2	SYN	Synchronization bytes
3	SB	Start byte 68H
4	SA	Slave address
5	ZA	Destination address
6	KB	Check byte
7	AB	Number byte
8	FC	Frame Check
9-X	DU	Data bytes
Y	DC	Data Check
Z	EB	End byte 16H

If no data format and no number of bytes (AB) is set in the request frame in the check byte, the data format and the number of bytes are entered into the answer frame from the address list.

Example: Request frame

00H	00H	00H	10H	07H	02H	00H	00H	19H	16H
	SYN		SB	SA	ZA	KB	AB	FC	EB

Answer to the example Request - Frame:

00H	00H	00H	68H	07H	02H	06H	02H	79H	00H	00H	8BH	16H
	SYN	SB		SA	ZA	KB	AB	FC		DU	DC	EB

3.7.4.5 Positive and Negative Confirmation

The “positive confirmation” is transmitted by the slave, if a set frame of the master has been executed validly. A “negative confirmation” is transmitted by the slave, if a set frame or a request frame couldn’t be executed validly.

Format of the positive/negative confirmation:

Byte:	0-2	3	4	5	6	7	8	9
Name:	SYN	SB	SA	ZA	KB	AB	FC	EB

Byte:	Name:	Function:	
0-2	SYN	Synchronization bytes	
3	SB	Positive:	Start byte A2H
		Negative:	Start byte DCH
4	SA	Slave address	
5	ZA	Ziel address	
6	KB	Check byte	
7	AB	Number byte	
8	FC	Frame Check	
9	EB	End byte 16H	

The check byte is occupied by 00Hex for positive confirmation and by an error code for negative confirmation.

Example: Positive confirmation

00H	00H	00H	A2H	07H	02H	00H	00H	ABH	16H
	SYN		SB	SA	ZA	KB	AB	FC	EB

Example: Negative confirmation

00H	00H	00H	DCH	07H	02H	02H	00H	A5H	16H
	SYN		SB	SA	ZA	KB	AB	FC	EB

3.7.5 Address Reference List

<u>NOTE</u>: To each Depolox® 3 *plus* two addresses are allocated. Each of the two addresses lead to a corresponding address reference list (e.g., Adr00 for Cl_2 measurement, Adr01 for pH or fluoride measurement).

KEY	
Abbreviations of the data formats	BOOL-boolean, UCHAR-unsigned char, SCHAR-signed char, USINT-unsigned integer, SINT-signed integer, ULONG-unsigned long, SLONG-signed long, FLOAT- float, ASCII-ASCII-code
Abbreviations of access	L-read, S-write, LP-read with password, SP-write with password, SW-write with Siemens Water Technologies-password
Data structure 1	Byte1-2: Measured valuet (signed int), Byte3-4: range-start (signed int), Byte 5-6: range-end (signed int), Byte7-11: unit (ASCII), Byte12: divider (character)

Table 3.4 - Address Reference List - Address 1 - Chlorine

ADDR.	DESCRIPTION	FORMAT	LENGTH	RANGE	UNIT	FACTOR	STATUS	NOTES
0.	date software version	ASCII	12	-	-	-	L	"V: A_08/95"
1.	module name	ASCII	28	-	-	-	L	"COMMON Electronic - Analyzer"
2.	password of interface	USINT	2	0...999	-	1,0	L, S	"904"
3.	module type	ASCII	12	-	-	-	L	"Depolox® 3 DES"
4.	operation mode	UCHAR	1	-	-	-	L	0x01 (Automatic - no manual-mode possible)
5.	measured DES	UCHAR	12	-	-	-	L	data structure 1
6.		UCHAR	12	-	-	-	L	0x2D
7.		UCHAR	12	-	-	-	L	data structure 1
8.	Low - Alarm DES	UCHAR	12	-	-	-	L	data structure 1
9.	High - Alarm DES	UCHAR	12	-	-	-	L	data structure 1
10.		UCHAR	12	-	-	-	L	0x2D
11.		UCHAR	12	-	-	-	L	0x2D
12.	setpoint DES	UCHAR	12	-	-	-	L	data structure 1
13.	module option	UCHAR	1	-	-	-	L	0x03 (Regulator + Temperature)
14.	alarm and digital input	UCHAR	1	-	-	-	L	0x01 - alarm 1 (K1) activated 0x02 - alarm 2 (K2) activated 0x04 - alarm 3 (K3) activated 0x08 - alarm 4 (K4) activated 0x10 - digital input activated
15.	error status	UINT	2	-	-	-	L	0x0001 - Sollwert error DES 0x0002 - Low/High DES error 0x0004 - Low/High DES error 0x0020 - mA output error 0x0040 - ADC1 error 0x0080 - ADC2 error 0x0100 - ADC3 error 0x0400 - temperature sensor error 0x0800 - zero error 0x1000 - DPD error 0x4000 - cell error
16.		SINT	2	-	-	-	L	0x2D
17.		FLOAT	4	-	-	-	L	0x2D
18.	module language	UCHAR	1	-	-	-	L, SP	0x01 - german 0x02 - english 0x04 - french 0x08 - spanish
19.		SINT	2	-	-	-	L	0x2D
20.	setpoint DES	SINT	2	depends on range	mg/l	0,1/0,01	L, SP	--
21.		SINT	2	-	-	-	L	0x2D
22.		SINT	2	-	-	-	L	0x2D
23.	Alarm Relay 1 Definition	UCHAR	1	-	-	-	L, SP	0x01 - High 0x02 - Low 0x04 - High/Low 0x08 - General Fault 0x10 - DI 0x20 - Dose contact 0x80 - End
24.	Alarm Relay 1 Operation	UCHAR	1	-	-	-	L, SP	0x01 - norm. open 0x02 - fail safe
25.	Low Alarm Value DES	SINT	2	depends on range	mg/l	0,1/0,01	L, SP	-

Table 3.4 - Address Reference List - Address 1 - Chlorine (Cont'd)

ADDR.	DESCRIPTION	FORMAT	LENGTH	RANGE	UNIT	FACTOR	STATUS	NOTES
26.	Alarm 1 Hysteresis	SINT	2	1...25	digit	1,0	L, SP	-
27.	Alarm Relay 1 Delay	SINT	2	0...60	min	1,0	L, SP	-
28.	Alarm Relay 2 Definition	UCHAR	1	-	-	-	L, SP	0x01 - High 0x02 - Low 0x04 - High/Low 0x08 - General Fault 0x10 - DI 0x80 - End
29.	Alarm Relay 2 Operation	UCHAR	1	-	-	-	L, SP	0x01 - norm. open 0x02 - fail safe
30.	High Alarm Value DES	SINT	2	depends on range	mg/l	0,1/0,01	L, SP	-
31.	Alarm 2 Hysteresis	SINT	2	1...25	digit	1,0	L, SP	-
32.	Alarm Relais 2 Delay	SINT	2	0...60	min	1,0	L, SP	-
33.		UCHAR	1	-	-	-	L	0x2D
34.		UCHAR	1	-	-	-	L	0x2D
35.		SINT	2	-	-	-	L	0x2D
36.		SINT	2	-	-	-	L	0x2D
37.		SINT	2	-	-	-	L	0x2D
38.		UCHAR	1	-	-	-	L	0x2D
39.		UCHAR	1	-	-	-	L	0x2D
40.		SINT	2	-	-	-	L	0x2D
41.		SINT	2	-	-	-	L	0x2D
42.		SINT	2	-	-	-	L	0x2D
43.		UCHAR	6	-	-	-	L	0x2D
44.	Contrast	SINT	2	0 ... 100	%	1	L, SP	--
45.	Eprom - Storage no.	CHAR	7	-	-	-	L	"AAB1603"
46.	Eprom - Version	CHAR	9	-	-	-	L	"V:A_06/01"
47.	SUM		217					

Table 3.5 - Address Reference List - Address 2 - pH

ADDR.	DESCRIPTION	FORMAT	LENGTH	RANGE	UNIT	FACTOR	STATUS	NOTES
0.	date software version	ASCII	12	-	-	-	L	"V:A_08/95"
1.	module name	ASCII	28	-	-	-	L	"COMMON Electronic - Analyzer"
2.	password of interface	USINT	2	0... 999	-	1,0	L, S	"904"
3.	module type	ASCII	12	-	-	-	L	"Depolox®3 pH"
4.	operation mode	UCHAR	1	-	-	-	L	0x01 0x01 (Automatic - no manual-mode possible)
5.	measured value pH	UCHAR	12	-	-	-	L	data structure 1
6.		UCHAR	12	-	-	-	L	0x2D
7.	sample water temperature	UCHAR	12	-	-	-	L	data structure 1
8.	Low alarm pH	UCHAR	12	-	-	-	L	data structure 1
9.	High alarm pH	UCHAR	12	-	-	-	L	data structure 1
10.		UCHAR	12	-	-	-	L	0x2D
11.		UCHAR	12	-	-	-	L	0x2D
12.		UCHAR	12	-	-	-	L	0x2D
13.	module option	UCHAR	1	-	-	-	L	0x02 (Temperature)
14.	alarm and digital input	UCHAR	1	-	-	-	L	0x01 - relay 1 (K1) activated 0x02 - relay 2 (K2) activated 0x04 - relay 3 (K3) activated 0x08 - relay 4 (K4) activated 0x10 - digital input activated
15.	Error status	UINT	2	-	-	-	L	0x0002 - Low/High pH error 0x0004 - Low/High pH error 0x0020 - mA output error 0x0040 - ADC1 error 0x0080 - ADC2 error 0x0100 - ADC3 error 0x0200 - Calibration error 0x0400 - temperature sensor error 0x4000 - cell error
16.		SINT	2	-	-	-	L	0x2D
17.		FLOAT	4	-			L	0x2D
18.	module language	UCHAR	1	-	-	-	L, SP	0x01 - german 0x02 - english 0x04 - french 0x08 - spanish
19.		SINT	2	-	-	-	L	0x2D
20.		SINT	2	-	-	-	L	0x2D
21.		SINT	2	-	-	-	L	0x2D
22.		SINT	2	-	-	-	L	0x2D
23.	Alarm relay 1 definition	UCHAR	1	-	-	-	L, SP	0x01 - High 0x02 - Low 0x04 - High/Low 0x08 - General fault 0x10 - DI 0x80 - off
24.	Alarm relay 1 operation	UCHAR	1				L, SP	0x01 - norm. open 0x02 - fail safe
25.	Low alarm value pH	SINT	2	range	pH	0.01	L, SP	-

Table 3.5 - Address Reference List - Address 2 - pH (Cont'd)

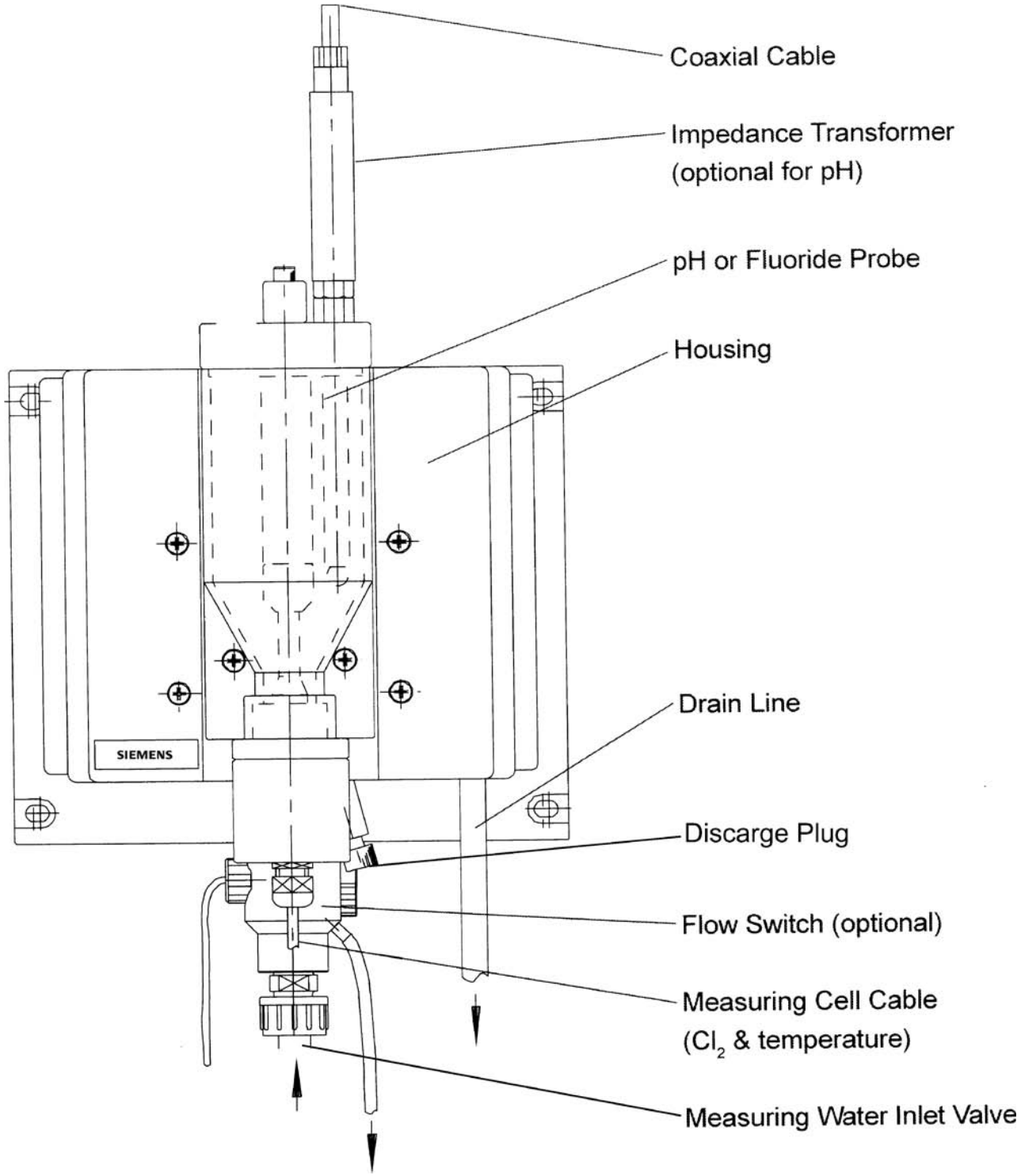
ADDR.	DESCRIPTION	FORMAT	LENGTH	RANGE	UNIT	FACTOR	STATUS	NOTES
26.	Alarm relay 1 hysteresis	SINT	2	1...25	digit	1.0	L, SP	-
27.	Alarm relay 1 delay	SINT	2	1...60	min	1.0	L, SP	-
28.	Alarm relay 2 definition	UCHAR	1	-	-	-	L, SP	0x01 - High 0x02 - Low 0x04 - High/Low 0x08 - General fault 0x10 - DI 0x80 - off
29.	Alarm relay 2 operation	UCHAR	1				L, SP	0x01 - norm. open 0x02 - fail safe
30.	High alarm value pH	SINT	2	range	pH	0.01	L, SP	-
31.	Alarm relay 2 hysteresis	SINT	2	1...25	digit	1.0	L, SP	-
32.	Alarm relay 2 delay	SINT	2	1...60	min	1.0	L, SP	-
33.		UCHAR	1				L	0x2D
34.		UCHAR	1				L	0x2D
35.		SINT	2				L	0x2D
36.		SINT	2				L	0x2D
37.		SINT	2				L	0x2D
38.		UCHAR	1				L	0x2D
39.		UCHAR	1				L	0x2D
40.		SINT	2				L	0x2D
41.		SINT	2				L	0x2D
42.		SINT	2				L	0x2D
43.		UCHAR	6				L	0x2D
44.	contrast	SINT	2	0...100	%	1	L, SP	--
45.	EPROM storage no.	CHAR	7	-	-	-	L	"AAB1603"
46.	EPROM version	CHAR	9	-	-	-	L	"V:A_06/01"
47.	Sum		217					

Table 3.6 - Address Reference List - Address 2 - Fluor

ADDR.	DESCRIPTION	FORMAT	LENGTH	RANGE	UNIT	FACTOR	STATUS	NOTES
0.	date software version	ASCII	12	-	-	-	L	"V: A_08/95"
1.	module name	ASCII	28	-	-	-	L	"COMMON Electronic - Analyzer"
2.	password of interface	USINT	2	0... 999	-	1,0	L, S	"904"
3.	module type	ASCII	12	-	-	-	L	"Depolox®3 Fl"
4.	operation mode	UCHAR	1	-	-	-	L	0x01 0x01 (Automatic - no manual-mode possible)
5.	measured value pH	UCHAR	12	-	-	-	L	data structure 1
6.		UCHAR	12	-	-	-	L	0x2D
7.	sample water temperature	UCHAR	12	-	-	-	L	data structure 1
8.	Low alarm pH	UCHAR	12	-	-	-	L	data structure 1
9.	High alarm pH	UCHAR	12	-	-	-	L	data structure 1
10.		UCHAR	12	-	-	-	L	0x2D
11.		UCHAR	12	-	-	-	L	0x2D
12.		UCHAR	12	-	-	-	L	0x2D
13.	module option	UCHAR	1	-	-	-	L	0x02 (Temperature)
14.	alarm and digital input	UCHAR	1	-	-	-	L	0x01 - relay 1 (K1) activated 0x02 - relay 2 (K2) activated 0x04 - relay 3 (K3) activated 0x08 - relay 4 (K4) activated 0x10 - digital input activated
15.	Error status	UINT	2	-	-	-	L	0x0002 - Low/High pH error 0x0004 - Low/High pH error 0x0020 - mA output error 0x0040 - ADC1 error 0x0080 - ADC2 error 0x0100 - ADC3 error 0x0200 - Calibration error 0x0400 - temperature sensor error 0x4000 - cell error
16.		SINT	2	-	-	-	L	0x2D
17.		FLOAT	4	-			L	0x2D
18.	module language	UCHAR	1	-	-	-	L, SP	0x01 - german 0x02 - english 0x04 - french 0x08 - spanish
19.		SINT	2	-	-	-	L	0x2D
20.		SINT	2	-	-	-	L	0x2D
21.		SINT	2	-	-	-	L	0x2D
22.		SINT	2	-	-	-	L	0x2D
23.	Alarm relay 1 definition	UCHAR	1	-	-	-	L, SP	0x01 - High 0x02 - Low 0x04 - High/Low 0x08 - General fault 0x10 - DI 0x80 - off
24.	Alarm relay 1 operation	UCHAR	1				L, SP	0x01 - norm. open 0x02 - fail safe
25.	Low alarm value pH	SINT	2	range	pH	0.01	L, SP	-

Table 3.6 - Address Reference List - Address 2 - Fluor (Cont'd)

ADDR.	DESCRIPTION	FORMAT	LENGTH	RANGE	UNIT	FACTOR	STATUS	NOTES
26.	Alarm relay 1 hysteresis	SINT	2	1...25	digit	1.0	L, SP	-
27.	Alarm relay 1 delay	SINT	2	1...60	min	1.0	L, SP	-
28.	Alarm relay 2 definition	UCHAR	1	-	-	-	L, SP	0x01 - High 0x02 - Low 0x04 - High/Low 0x08 - General fault 0x10 - DI 0x80 - off
29.	Alarm relay 2 operation	UCHAR	1				L, SP	0x01 - norm. open 0x02 - fail safe
30.	High alarm value pH	SINT	2	range	pH	0.01	L, SP	-
31.	Alarm relay 2 hysteresis	SINT	2	1...25	digit	1.0	L, SP	-
32.	Alarm relay 2 delay	SINT	2	1...60	min	1.0	L, SP	-
33.		UCHAR	1				L, SP	0x2D
34.		UCHAR	1				L, SP	0x2D
35.		SINT	2				L, SP	0x2D
36.		SINT	2				L, SP	0x2D
37.		SINT	2				L, SP	0x2D
38.		UCHAR	1				L, SP	0x2D
39.		UCHAR	1				L, SP	0x2D
40.		SINT	2				L, SP	0x2D
41.		SINT	2				L, SP	0x2D
42.		SINT	2				L, SP	0x2D
43.		UCHAR	6				L, SP	0x2D
44.	contrast	SINT	2	0...100	%	1	L, SP	-
45.	EPROM storage no.	CHAR	7	-	-	-	L	"AAB1603"
46.	EPROM version	CHAR	9	-	-	-	L	"V:A_06-01"
47.	Sum		217					



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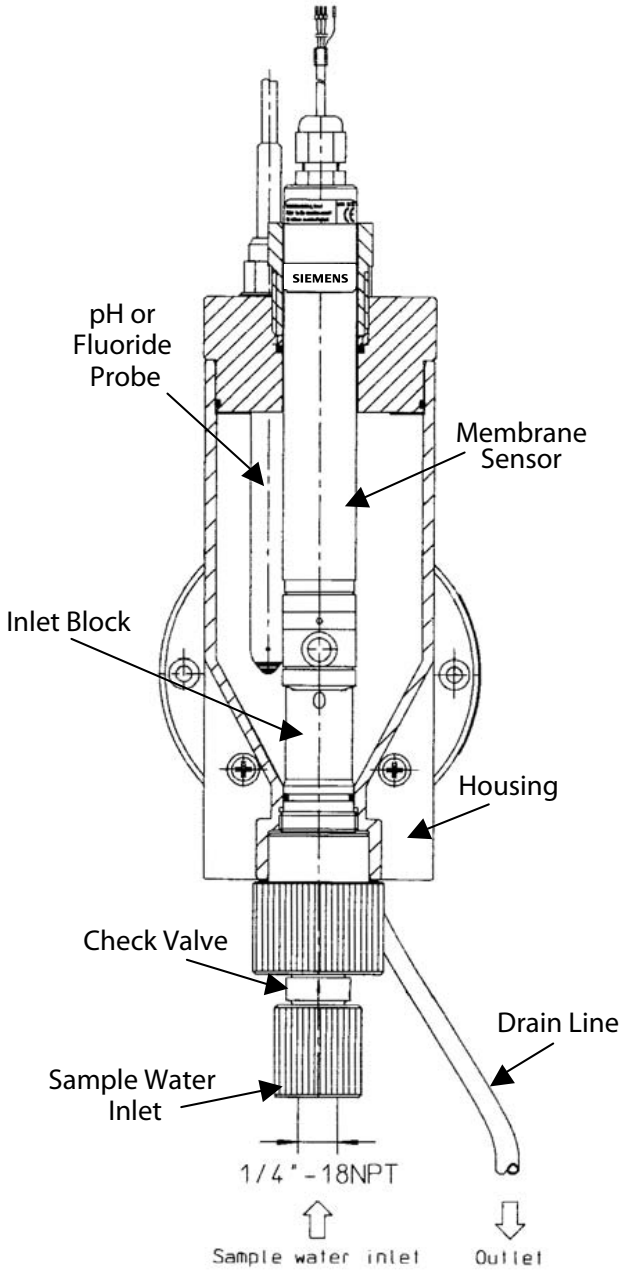

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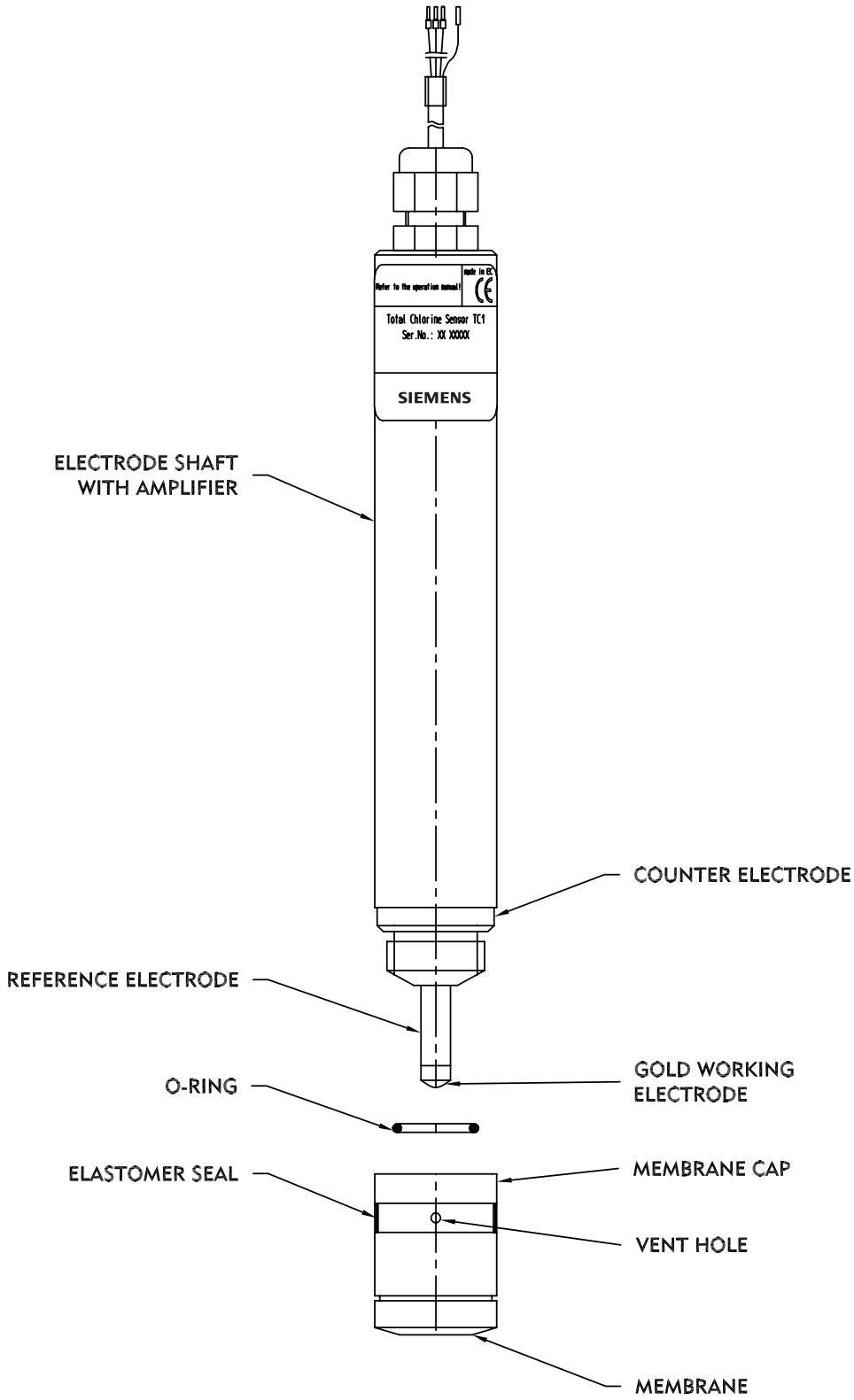

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50.560.160.020

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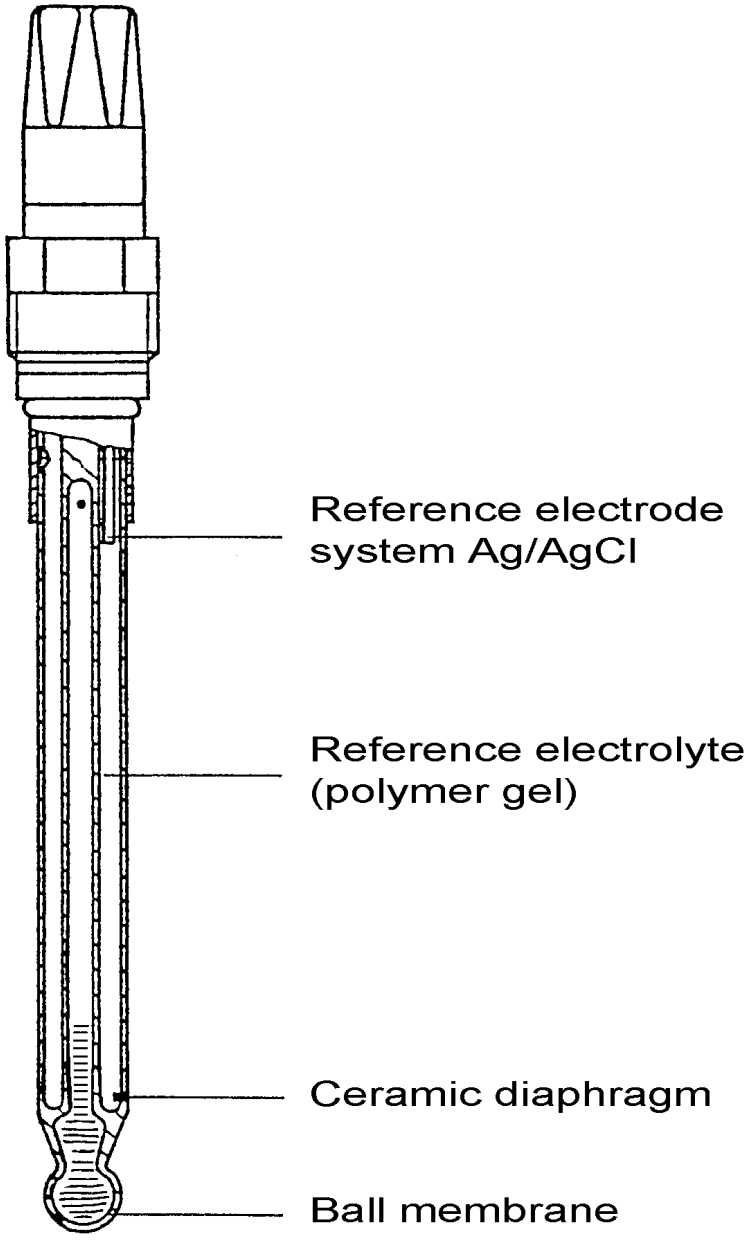


pH/FLUORIDE SENSOR KIT - ASSEMBLY

50.560.160.030

ISSUE 1 6-07

SECTION 4 - SERVICE

List of Contents

4.1 Depolox® 3 *plus*

Table 4.1 - Errors

Error Message	Cause	Remedy
High/Low Alarms: *min DIS ? * *max DIS ? * *min pH ? * *max pH ? * *min Fluor ? * *max Fluor ? *	Alarm value exceeded	Check dosing Check sample water flow
General Faults: *mA-output? *	Ma loop impedance too high Loop interrupted	Check mA loop <1000 ohm Jump if not used
*cell DIS ? * *cell pH ? * *cell Fluor ? *	Sensor wrongly connected Sensor cables interchanged or (In ph compensated mode) pH is out of range Sensor defective	Check wiring Perform calibration or Adjust pH Replace sensor
*Circ.Fail. ? *	Internal failure	Contact usf/w&t
*temperature ? *	Temperature failure	Check temp. Sensor, wiring
<u>Warnings</u> *Range ? *	Alarm value out of range Range changed subsequently Setpoint Cl_2 out of range	Adjust range or limit value Adjust range or setpoint
*ADU 1 ? * *ADU 2 ? * *ADU 3 ? *	Internal failure	Call Siemens Water Technologies service
*Cal. DIS ? * *Cal. pH ? * *Cal. Fluor ? *	Calibration error	Perform new calibration Check buffer solutions Replace electrolyte
*OVR DIS ? * *OVR pH ? * *OVR Fluor ? *	Value exceeds range Range does not fit Dosing too high	Check range and dosing
*DI1 ? * *DI2 ? * *DI3 ? *	Signal at the digital input	Check for the origin of the signal, e.g., sample water flow too low Jump if not used

Table 4.1 - Errors (Cont'd)

Error Message	Cause	Remedy
Additional Errors		
Device has no display	No mains power Defective fuse or wrong setting of mains voltage	Turn on external mains switch Check voltage setting and replace fuse, see paragraph 2.1.3
Displayed/output value wrong	Wrong calibration Old electrolyte or clogged membrane Wrong wiring or setting	New calibration Sensor maintenance Check sensor, wiring and setting
Device not responding correctly to software adjustments or corrections.	Incorrect software programming or corrupted memory.	Initialize software, see paragraph 3.1.9.

In case of an alarm:

- the alarm LED will become illuminated
- the display will detail the specific alarm every five seconds for one second for each alarm.
- if an alarm relay is associated to the alarm condition, the delay time will begin. At the end of the delay time the relay will be triggered.

NOTE: Refer to Table 4.2 - Relay / Display Operation During Alarm Conditions, for details.

Table 4.2 - Relay / Display Operation During Alarm Conditions

Alarm / ErrorType	Assigned to Relay	Alarm Status Sequence	Relay Type Latch / Non-latch	Press Alarm Ack key	Relay	Display	LED
Hi / Lo Alarm	yes	no alarm	Non-latch	NA	non-alarm state	no message	off
		alarm		NA	Alarm State	alarm message	on
		no alarm		NA	non-alarm state	no message	off
Hi / Lo Alarm	yes	no alarm	Latch	no	non-alarm state	no message	off
		alarm		no	alarm state	alarm message	on
		alarm		yes	non-alarm state	alarm message	blink
		no alarm		no	non-alarm state	no message	off
Hi / Lo Alarm	yes	no alarm	Latch	no	non-alarm state	no message	off
		alarm		no	alarm state	alarm message	on
		no alarm		no	alarm state	alarm message	on
		no alarm		yes	non-alarm state	no message	off
Hi / Lo Alarm	no	no alarm	NA	NA	NA	no message	off
		alarm	NA	NA	NA	alarm message	blink
		no alarm	NA	NA	NA	no message	off
General Fault	yes	no alarm	Non-latch	NA	non-alarm state	no message	off
		alarm		NA	Alarm State	alarm message	on
		no alarm		NA	non-alarm state	no message	off
General Fault	yes	no alarm	Latch	no	non-alarm state	no message	off
		alarm		no	alarm state	alarm message	on
		alarm		yes	non-alarm state	alarm message	blink
		no alarm		no	non-alarm state	no message	off
General Fault	yes	no alarm	Latch	no	non-alarm state	no message	off
		alarm		no	alarm state	alarm message	on
		no alarm		no	alarm state	alarm message	on
		no alarm		yes	non-alarm state	no message	off
General Fault	no	no alarm	NA	NA	NA	no message	off
		alarm	NA	NA	NA	alarm message	blink
		no alarm	NA	NA	NA	no message	off
Warning	no	no alarm	NA	NA	NA	no message	off
		alarm		NA	NA	alarm message	on
		no alarm		NA	NA	no message	off
Digital Input	yes	no alarm	Non-latch	NA	non-alarm state	no message	off
		alarm		NA	Alarm State	alarm message	on
		no alarm		NA	non-alarm state	no message	off
Digital Input	yes	no alarm	Latch	no	non-alarm state	no message	off
		alarm		no	alarm state	alarm message	on
		alarm		yes	non-alarm state	message	blink
		no alarm		no	non-alarm state	no message	off
Digital Input	yes	no alarm	Latch	no	non-alarm state	no message	off
		alarm		no	alarm state	alarm message	on
		no alarm		no	alarm state	alarm message	on
		no alarm		yes	non-alarm state	no message	off
Digital Input	no	no alarm	NA	NA	NA	no message	off
		alarm		NA	NA	alarm message	blink
		no alarm		NA	NA	no message	off

4.2 Maintaining AAB5383 Bare Electrode Flow Block Assembly

4.2.1 Maintenance

- Daily checks

  Each day check the complete unit for leaks, including all pipe unions and glands, and rectify all leaks immediately.

NOTE: All air leaks must receive immediate attention as they will have a detrimental effect on the operation of the cell unit. Should an air leak occur upstream of the measuring cell assembly, bubbles are seen passing through the cell block. With a leak down stream of the cell assembly, bubbles are seen only in the drain hose from the cell block.

Measure the actual free chlorine residual by any standard colorimetric or titration method ensuring the equipment manufacturers instructions are strictly observed.

Draw the sample water from the sample drain nipple (see Dwg. 50.560.160.010 in Section 3).

NOTE: It is very important to obtain consistent results when measuring the residual value of the test sample and it is recommended that precisely the same method is used every time a sample is tested.

If the indicated residual on the controller or amplifier display varies from the measured residual by more than is acceptable to the user, carry out the calibration procedure referred to in paragraph 3.2.1, Free Chlorine (Bare Electrode) Calibration.

If the variation still remains after recalibration, refer to "Bimonthly check," below.

- Weekly checks

With the sample water turned on, check that there is sufficient grit in the measuring cell block to keep the electrodes clean. This will be indicated by the amount of grit being swirled about in the vortex of the cell. Lack of grit will lead to insufficient cleaning and more grit must be added.

NOTE: When fresh grit is added to the cell block a temporary rise in cell output will normally occur which, generally, will last for two to three hours. It is important that no calibration adjustments are made during this period.

- Monthly checks

  Remove and clean, if fitted, the detachable element of the strainer in the sample water supply line. Check the calibration of the cell (refer to paragraph 3.2.1, Free Chlorine (Bare Electrode) Calibration)

- Bimonthly checks (see Dwg. 50.560.000.010)

  a. Check the zero point to ensure no drift has occurred.

  b. Check that the potassium chloride electrolyte is level with the bottom of the electrolyte reservoir neck and top up if necessary. This operation can be carried out by removing the plug (4) in the top of the electrolyte reservoir and filling with a syringe.

  c. The particles of grit used for continuous electrode cleaning take approximately two months to wear down. After this period of time the grit should be replaced. The procedure for grit replacement is detailed later.

  d. The membranes in the electrode case (6) form an interface between the reference electrolyte and the sample water. If the quality of the water passing through the cell is poor, especially if the water has a high iron content, inspect the two porous membranes (6) located in the electrode case. They should be white in color and any obvious discoloration is a sign that the membranes are becoming clogged up and should be replaced.

- Semi-annual checks

  Every six months the reference electrolyte should be replaced. Electrolyte replacement can be incorporated into a grit replacement operation. Having removed the reservoir (see steps a through f in the procedure on Grit Replacement that follows), the electrolyte should be discarded safely and the reservoir thoroughly washed in distilled water. Check the condition of the porous membranes and replace if needed. Refill the reservoir to the neck with fresh electrolyte and continue from step g in the Grit Replacement procedure.

- Grit Replacement (See Dwg. 50.560.000.010)

  When they become worn, grit particles should be replaced by taking the following steps:

  a. Close the shut-off valve at the cell inlet.

b. Drain the cell by unscrewing the drain plug.

c. When the cell block is empty, install the drain plug.

d. Unscrew the electrolyte reservoir clamping nut (2) and remove the cell cover (3).

e. Withdraw the complete electrode/electrolyte reservoir assembly (4 to 11) from its housing. This can be achieved by exerting a gentle pressure at the top of the electrolyte reservoir. Rinse off the reservoir to remove any remaining grit particles.

f. Being careful of the cable connector, replace the assembly ensuring that the keying pin in the base of the cell block locates into its corresponding hole in the electrode housing (8).

g. Empty a half capful of grit into the cell block and replace the cover. The assembly should then be secured in its housing with the clamping nut.

h. Open the sample water shut-off valve at the inlet to the measuring cell assembly.

i. Leave the cell running for an hour, to allow the system to settle down, and then carry out the zero calibration procedure. This procedure may be repeated after 24 hours if required.

- Electrode and membrane replacement

  The membranes, which form the contact point between reference electrode and sample water, cannot be cleaned. With very good water quality, membrane life may extend for up to three years continuous use. After this period of time however, they should be replaced. Where the quality of the sample water is particularly poor, fouling of the membranes may occur with a corresponding loss in cell efficiency (Refer to the note in "Bimonthly check," above, for further details).

  With the electrode/electrolyte reservoir assembly withdrawn from the cell block as described above, the electrodes may be removed and replaced as follows (see Dwg. 50.560.000.010):

  a. Slacken the cable gland locking nut and unscrew the cable gland (11) taking care to avoid rotating the cable.

b. Unscrew the cover (10) and remove the push-fit connections from each electrode (and the temperature sensor if fitted).

c. Unscrew the nut (9) which clamps the electrolyte reservoir to the electrode housing (8) and separate the two items.

d. If the reference electrode (7) is to be replaced, hold the electrolyte reservoir vertical with the electrode uppermost. The electrode may now be unscrewed, by holding it just below the wire stem, and replaced.

e. To replace the two membranes (6) in the reservoir housing a pair of pointed tweezers (or similar) should be used. Insert the points into the holes in the pvc body of the membrane and gently pull and turn until the membrane is removed.

f. Fit new membrane using the same technique.

NOTE: The two half ring type platinum electrodes are arranged one above the other in the top recess of the electrode housing (8), with the counter electrode uppermost. To replace the working electrode it is necessary to first remove the counter electrode.

g. Gently push the stem (blue spot) of the counter electrode until the half ring can be grasped and the electrode removed from the housing.

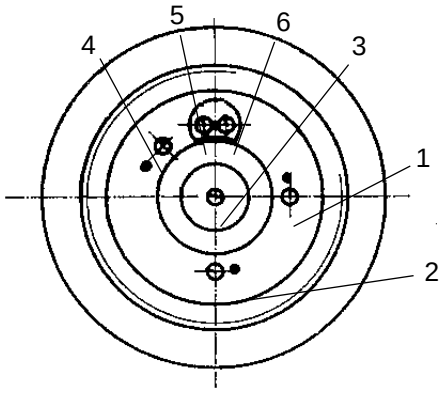
h. If the working electrode (red spot) is to be replaced repeat step g with the working electrode.

i. Carefully clean any grit or other deposits from the electrode recess in the upper housing ensuring no moisture enters the electrode stem bore.

j. Fit the replacement working electrode into thetop of the housing and gently (to avoid disturbing the 'O' rings in the bore) push the electrode down into position.

k. Repeat step j with the counter electrode.

l. Reassemble the reservoir to the electrode housing and, ensuring the bottom cover (10) is on the cable, reconnect the signal wires as shown in Figure 4.1:



(1) Counter electrode (blue spot) blue wire
(2) Working electrode (red spot) pink wire
(3) Reference electrode white wire
(4) Earth grey wire
(5) Temperature sensor brown wire
(6) Temperature sensor yellow & green wire

Figure 4.1

m. Reassemble the cover (10) and cable gland (11) to the electrode housing.

n. Refit the electrode/electrolyte reservoir assembly and secure with the clamping nut (2).

o. Reconnect the water inlet line, outlet line and the cell drain line.

p. Leave the cell running for an hour, to allow the system to settle down, and then carry out the zero calibration procedure. This procedure may be repeated after 24 hours if required.

4.2.2 Troubleshooting

The following troubleshooting table is provided for determining and correcting most common troubles.

Table 4.3 - Troubleshooting - Free Chlorine (Bare Electrode) Sensor Kit

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
Insufficient sample water flow	drain hose free fall restricted	Ensure 1500mm free fall
	dirt in cell unit	clean cell
	air bubbles	check lines
	blocked strainer	clean strainer
	shut-off valve closed	open
	regulating valve not working correctly	strip and clean regulator
Air leaks	faulty o-rings	grease or replace
	faulty pipe connections	check and make good where needed
	booster	check and make good where needed
Electrode current too low	dirty electrodes	clean with fine sand paper, add more grit
	worn electrodes	replace
	electrodes touching	adjust
Unsteady output from electrodes	membrane clogged	replace
	air bubbles on inner surface of membrane	adjust
Zero or span not adjustable	zero current too high or too low	wait until 24-hour running-in period is completed
		measure the electrode voltage across terminals 30 and 31 and adjust Upot to 0.25V. Zero current must be <±5µA
		shut-off valve not closed at zero calibration
	cell current too low or too high	check µA-range
		increase sample water flow
		see also “Electrode current too low,” above
Indicated value oscillates considerably at constant chlorine concentration	considerable fluctuations in water pressure	check pressure
	fluctuation in pH value	check pH value
	inlet to cell body or flow regulator clogged	clean inlet or flow regulator
	flow regulator defective	check or replace

4.3 Maintaining AAC6208 Bare Electrode Flow Block Assembly

Replacing Cell Sand in AAC6208 Three-Electrode Cell

The cell sand required for constant cleaning of the electrodes grinds itself down over time until it is very fine. It must be replaced regularly. Cell sand is delivered in a plastic bottle:

1. Remove flow block assembly cover.
2. Close the ball valve on the sample water inlet.
3. Open the drain valve and drain the cell body (hold container underneath).
4. Close the drain valve when the cell body is empty.
5. Remove the sensors. Loosen the cable union (hold the cable while doing this as it may not be allowed to rotate).
6. Loosen the lower cap on the 3 electrode cell.
7. Remove the signal cable.
8. Unscrew the upper knurled nut on the electrolyte container.
9. Remove the electrolyte tank out of the cell body from below using the electrode mount.
10. Wash the cell sand out of the electrode mount.
11. Insert the electrode mount back into the cell body using the electrolyte container.
12. The cell body's dowl pin must be locked into place in the appropriate hole in the electrode mount.

<u>NOTE:</u> Screw the upper knurled nut back onto the electrolyte container.

13. Reconnect the signal cable acc. to color.

CNT	Counter electrode	Blue point	Blue cable
WRK	Working electrode	Red point	Pink cable
Ref	Reference electrode (middle)		White cable

14. Screw the cap back on.
15. Fill half a cap from the plastic bottle with cell sand and pour it into the cell body (approx. 1/2 cm^3 cell sand) (see section 3.3.4 "Adding Grit (Bare Electrode)").
16. Reinsert electrodes.
17. Reopen the check valve on the sample water inlet.
18. Perform calibration after approximately three hours running-in time.

NOTE: You must calibrate each time the cell sand is replaced. The calibration must be checked after one day. We recommend checking and, if necessary, replacing the electrodes and diaphragms when replacing the cell sand (see "Replacing electrolyte, electrodes and porous membranes").

AAC6208 Three-Electrode Cell Check Electrolyte Level

1. Check whether the electrolyte is filled approx. 3 cm over the water level (narrowing of the KCL container) and replenish, if necessary.
2. To do this, remove the plug in the upper part of the electrolyte tank and inject the electrolyte (use the syringe in the accessory set). The porous membranes in the electrolyte tank form the connection between the reference electrolytes and the sample water. If the sample water quality is poor (e.g. high iron content), both porous membranes in the electrolyte housing should be replaced. The porous membranes should be white (any coloration is an indication that the porous membranes are clogged and should be replaced).
3. Calibrate after approximately three hours.

NOTE: The calibration must be checked after one day.

Replacing Electrolyte, Electrodes and Porous Membranes

1. Remove flow block assembly cover.
2. Close the ball valve on the sample water inlet.
3. Open the drain valve and drain the cell body (hold container underneath).
4. Close the drain valve when the cell body is empty.
5. Remove the sensors. Loosen the cable union (hold the cable while doing this as it may not be allowed to rotate).
6. Loosen the lower cap on the 3 electrode cell.
7. Remove the signal cable.

Replace Electrolyte

8. Unscrew the upper knurled nut on the electrolyte container.
9. Remove the electrolyte tank out of the cell body from below using the electrode mount.
10. Remove the electrolyte container from the electrode mount. To do this, unscrew the knurled nut in the electrode mount.
11. Remove the electrolyte container out the electrode mount from the top.
12. Remove the drain plug from the electrolyte container.
13. Turn the electrolyte container upside down and drain the electrolytes by lightly shaking it.

Replacing Reference Electrode

14. If necessary, replace the reference electrode. The reference electrode can be unscrewed from the electrolyte container. Lightly wet the O-ring before installinga new reference electrode.

Replacing Porous Membranes

15. The porous membranes, which form the contact between the reference electrodes and sample water, cannot be cleaned. If the water quality is very good, the porous membranes can remain installed for up to three years; they should be replaced thereafter (no exceptions). If the sample water quality is poor, the porous membranes may be soiled. This influences the measuring accuracy.
16. Remove both porous membranes from the electrolyte container using a suitable tool (e.g. tweezers).
17. Push new porous membranes into the electrolyte container. Lightly wet the O-rings.
18. Insert the electrolyte container back into the electrode mount. Lightly wet the O-ring here as well.
19. Fill the container with fresh electrolyte (approx. 3 cm above the water level or narrowing of the electrolyte container).
20. Insert the drain plug into the electrolyte container.
21. Insert the electrode mount back into the cell body using the electrolyte container.

<u>NOTE:</u> The cell body's dowl pin must be locked into place in the appropriate hole in the electrode mount.

22. Screw the upper knurled nut back onto the electrolyte container.
23. Reconnect the signal cable acc. to colour.

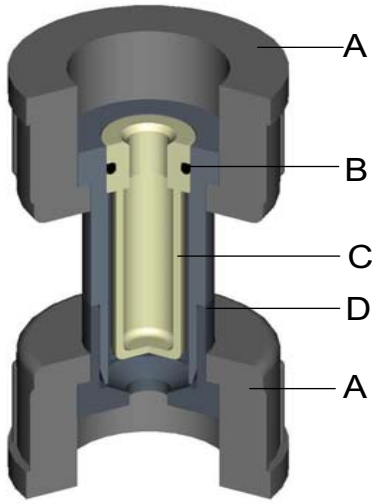
CNT	Counter electrode	Blue point	Blue cable
WRK	Working electrode	Red point	Pink cable
Ref	Reference electrode (middle)		White cable

24. Screw the cap back on.
25. Fill half a cap from the plastic bottle with cell sanc and pour it into the cell body (approx. 1/2 cm^3 cell sand) (see section 3.3.4 "Adding Grit (Bare Electrode)").
26. Reinsert electrodes.
27. Reopen the check valve on the sample water inlet.
28. Perform calibration after approximately three hours running-in time.

NOTE: **Perform a calibration after one hour running-in time and, if required, after 24 hours. You must calibrate each time the cell sand is replaced. The calibration must be checked after one day. Note the electrolyte's expiration date. We recommend replacing the cell sand when replacing the electrodes and porous membranes.**

Cleaning/Replacing the Fine Filter

A fine filter must only be installed when membrane sensors are employed. The fine filter must be cleaned or replaced in order to protect the membrane sensor's delicate membrane against soiling or damage.



A	Knurled nut
B	O-ring
C	Fine filter
D	Filter unit

1. Release both knurled nuts (A)
2. Remove complete filter unit (D)
3. Remove the fine filter (C)

To do this, screw the M6 screw slightly into the fine filter and pull the fine filter out of the filter unit
OR
Press the fine filter (C) with a suitable tool (not pointed) out of the filter unit.

4. Rinse the fine filter (C) with water, replace if necessary.
5. Place the fine filter (C) into the filter unit (D).
6. Ensure that the O-ring is fitted correctly (insert as far as possible).
7. Fit the filter unit (D). Ensure that it is fitted in the correct position.
8. Tighten both knurled nuts (A).

4.3.1 Maintaining Membrane Sensors

For the membrane sensor maintenance procedure, see section 2.3 “Membrane sensors”.

- “Membrane sensor for free chlorine FC1”
- “Membrane sensor for chlorine dioxide CD7”
- “Membrane sensor for ozone OZ7”
- “Membrane sensor for total chlorine TC1”

To keep the sensor in a constant state of readiness, leave the cap in place on the sensor until it is about to be installed. Do not discard the cap, but keep it and use it to protect the sensor whenever it is removed from service. Then fill the cap with water (not distilled) and place it over the tip of sensor.

The pH sensor has a threaded plug-in head. Care must be taken to ensure that the O-ring is present when connecting the head. A standard 1.5 m long, shielded coaxial (measuring) cable is supplied with the pH sensor. At one end the cable has a special plug which is screwed on to the threaded plug-in head of the sensor. The other end of the shielded special cable is connected directly to the intended terminal connection in the PCS control module.

4.3.2 Maintaining pH Electrode

Clean and calibrate if there are fluctuations in the measured values. A routine schedule cannot be given here because the cleaning schedule depends heavily on the general condition of the sample water. In general, calibrate approx. every 4 weeks. Remove dirt on the glass membrane and diaphragm to prevent measuring errors. In particular, the ceramic electrode diaphragm may also be soiled or coated with lime deposits.

Remove contaminants deposited on the surface of the membrane glass; use diluted hydrochloric acid (up to 10 %), if necessary. The electrodes should not be cleaned in a dry state because this is more likely to smear the layer of dirt over the surface rather than removing it. Under no circumstances may the membrane be treated with abrasive cleaning agents.

The electrode must be rinsed subsequently with nothing other than water.

Remove lime deposits on the glass membrane and the diaphragm by immersing the electrode into hydrochloric acid (up to 10 %). Rinse thoroughly with water or distilled water here as well; pH electrodes age. This is often

the cause for a slow display of the pH value or a drop in the slope. pH electrodes typically last 1 to 2 years. However, routine maintenance of the electrodes recommended.

4.3.3 Maintaining Fluoride Electrode

If using the refillable electrolyte probe, routinely check the electrolyte level in the electrode (at least once per week). The fill level should always be just under the filling hole, approx. 25 mm above the sample water. Replenish the electrolyte, if necessary. Routinely calibrate the measuring system to guarantee safe operation and accuracy.

If using the gel electrolyte probe, remove contaminants deposited on the surface of the membrane glass; use diluted hydrochloric acid (up to 10 %), if necessary. The electrodes should not be cleaned in a dry state because this is more likely to smear the layer of dirt over the surface rather than removing it. Under no circumstances may the membrane be treated with abrasive cleaning agents.

Do not touch the glass surfaces with the cloth.

4.4 Membrane Sensor Kit

4.4.1 Maintenance

Daily: Check the entire system including all screw fittings for leakage and repair any leaks immediately. Using the cell outlet (see Dwg. 50.560.100.030 in Section 2), carry out a manual measurement every day.

NOTE: The same test method should always be used in order to obtain consistent comparisons between results. Air bubbles at the membrane effect the accuracy of measurement. The cause must be determined and rectified.

When there is an obvious difference between the displayed value and the manually measured value then a calibration must be performed (refer to paragraph 3.2.2, Membrane Calibration). If the deviation remains, even after calibration, then the electrodes should be cleaned in accordance with the manufacturers instructions (see instruction sheet contained in the sensor packaging).

Monthly: Perform a calibration.

4.4.2 Maintenance of the Membrane Probes

NOTE: Do not touch the membrane or reference electrode.

Before unscrewing the membrane cap, remove the elastomer seal to allow air into the vent hole. Unscrew the membrane cap, clean the reference electrode with distilled water and then dry with a clean paper towel. Cover the vent hole with the elastomer seal. Refill the cap with new electrolyte (refer to paragraph 2.3, Membrane Sensor). If the signal is still low or unstable, it may be necessary to replace the cap with a new one (refer to Section 6 - Spare Parts List).

After this procedure, the probe requires a run-in time of about one to two hours before recalibration.

4.4.3 Troubleshooting

The following troubleshooting table is provided for determining and correcting most common troubles.

Table 4.4 - Troubleshooting - Membrane Sensor Kit

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
Insufficient flow of measuring water	free runoff prevented; back pressure too high	check for free drain or return
	dirt in cell	clean measuring cell
	air bubbles	check sample water take-off
	screen in water inlet blocked	clean
	inlet valve closed	open valve
Air bubbles	leaking O-rings	replace O-rings
	incorrect fittings	check and if necessary tighten or replace
DIS Electrode current too low	electrolyte exhausted	perform sensor maintenance
	membrane defective	replace membrane cap
DIS Span cannot be adjusted	measuring cell gives insufficient current	perform sensor maintenance
		The minimum current difference between un-chlorinated and chlorinated water with 1 mg/l residual DIS must be at least >2µA. If the difference is smaller, carry out maintenance.
Strong fluctuations in display, though chlorine concentration is constant	sample water flow too low	check; if necessary, clean inlet
	electrolyte exhausted	perform sensor maintenance

SECTION 5 - ILLUSTRATIONS

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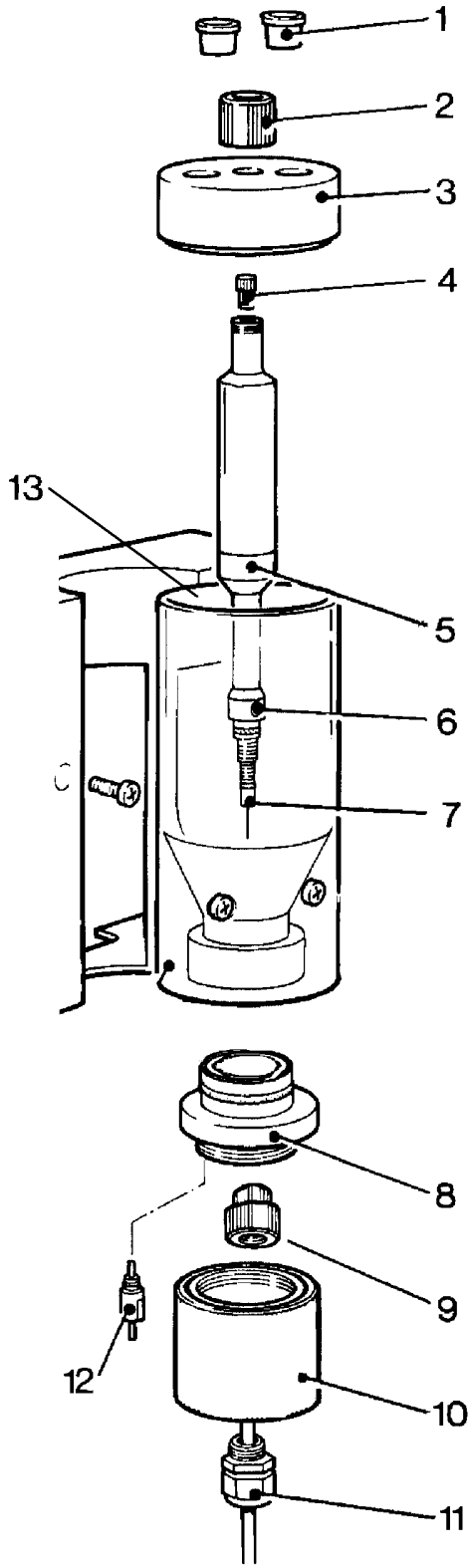

NOTE: FOR PARTS LIST, SEE DWG. 50.560.000.010B.

AAB5383 BARE ELECTRODE SENSOR KIT - PARTS

50.560.000.010A

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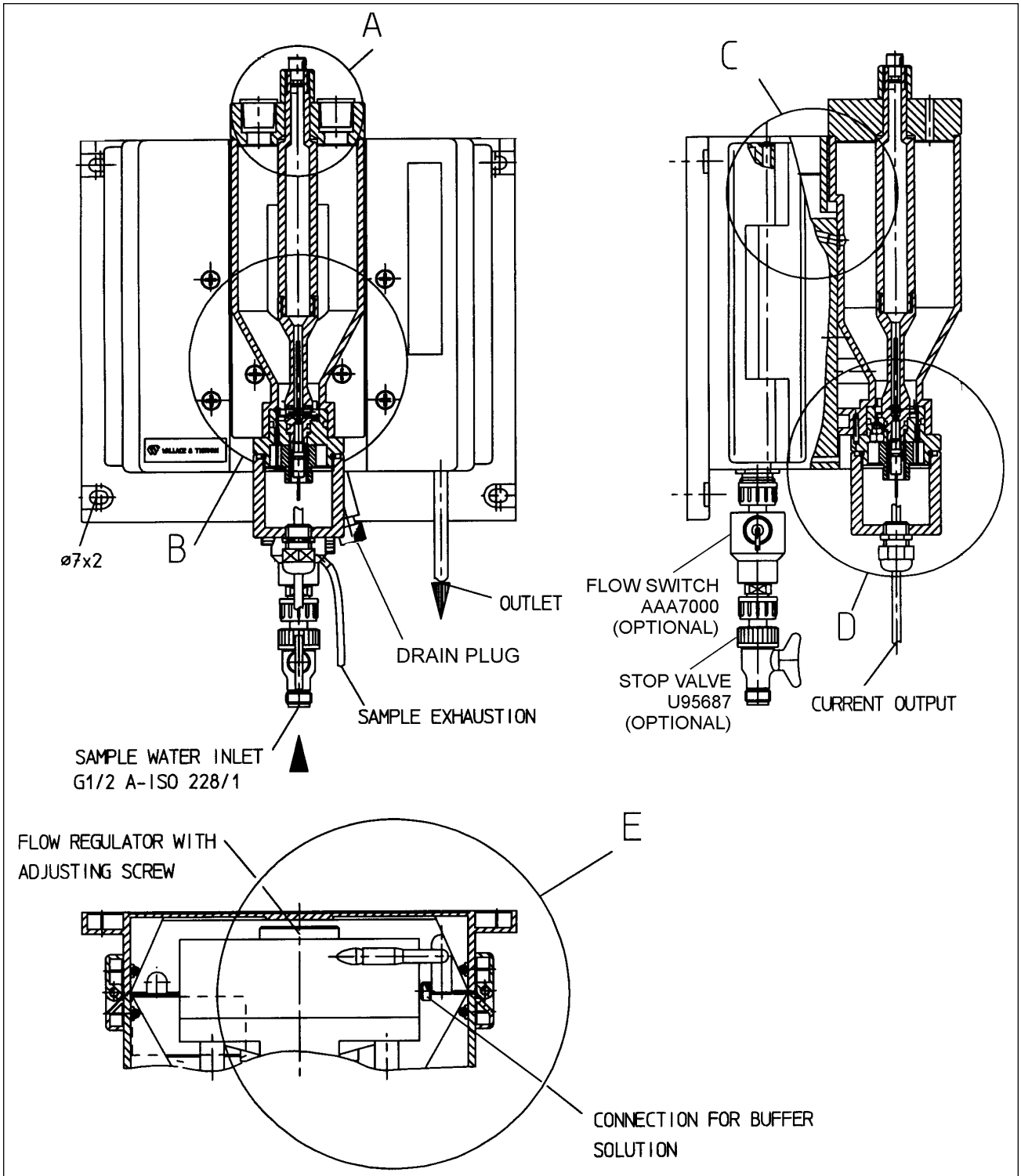
KEY NO.	PART NO.	QTY.	DESCRIPTION
1	P96487	2	CAP
2	P96191	1	NUT
3	P96714	1	COVER
4	UXB95664	1	PLUG
5	U86964	1	ELECTROLYTE RESERVOIR
6	U95641	2	MEMBRANE
7	U95626	1	REFERENCE ELECTRODE
8	U95827	1	ELECTRODE HOUSING (W/ WORKING & COUNTER ELECTRODE)
9	P96208	1	NUT
10	P96207	1	COVER
11	UXB95656	1	CABLE CONNECTOR
12	U95624	1	TEMPERATURE SENSOR
13	P96379	1	CELL BLOCK

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

AAB5383 BARE ELECTRODE SENSOR KIT - PARTS LIST

50.560.000.010B
ISSUE 2 6-07

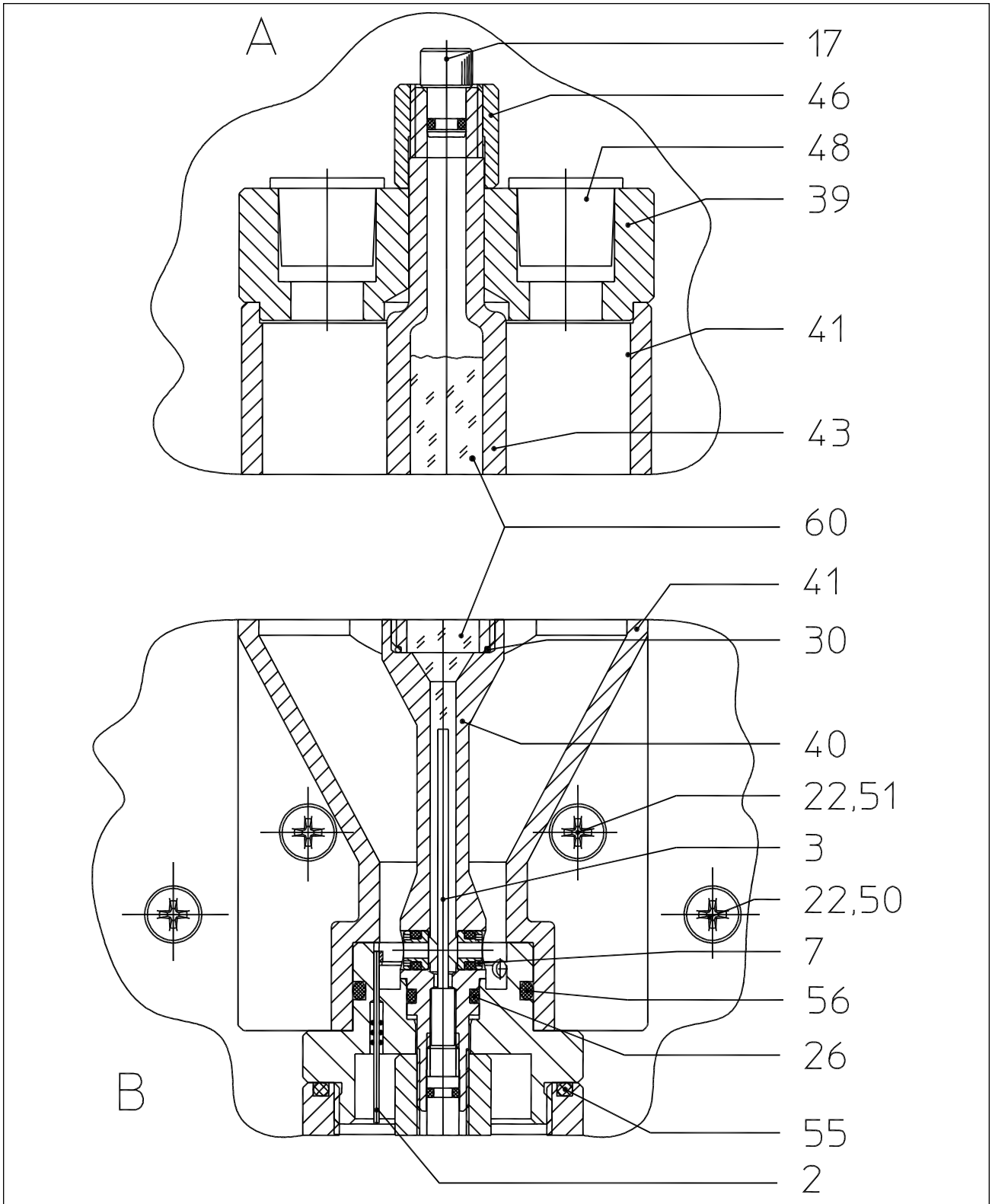


NOTE: FOR PARTS LIST, SEE DWG. 50.560.000.020E.

AAB5383 BARE ELECTRODE RESIDUAL ANALYZER - PARTS

50.560.000.020A

ISSUE 3 6-07

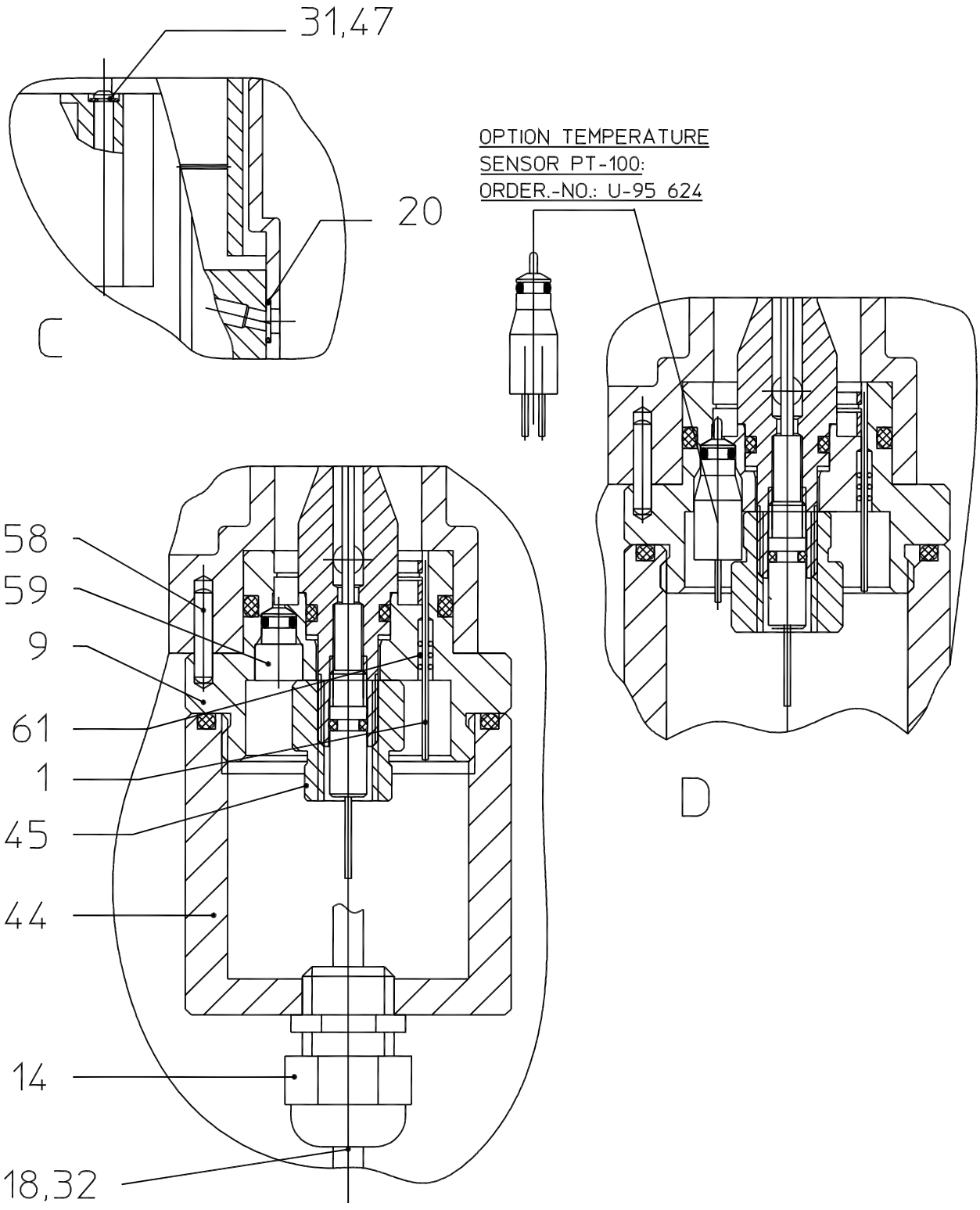


NOTE: FOR PARTS LIST, SEE DWG. 50.560.000.020E.

AAB5383 BARE ELECTRODE RESIDUAL ANALYZER - PARTS

50.560.000.020B

ISSUE 2 6-07

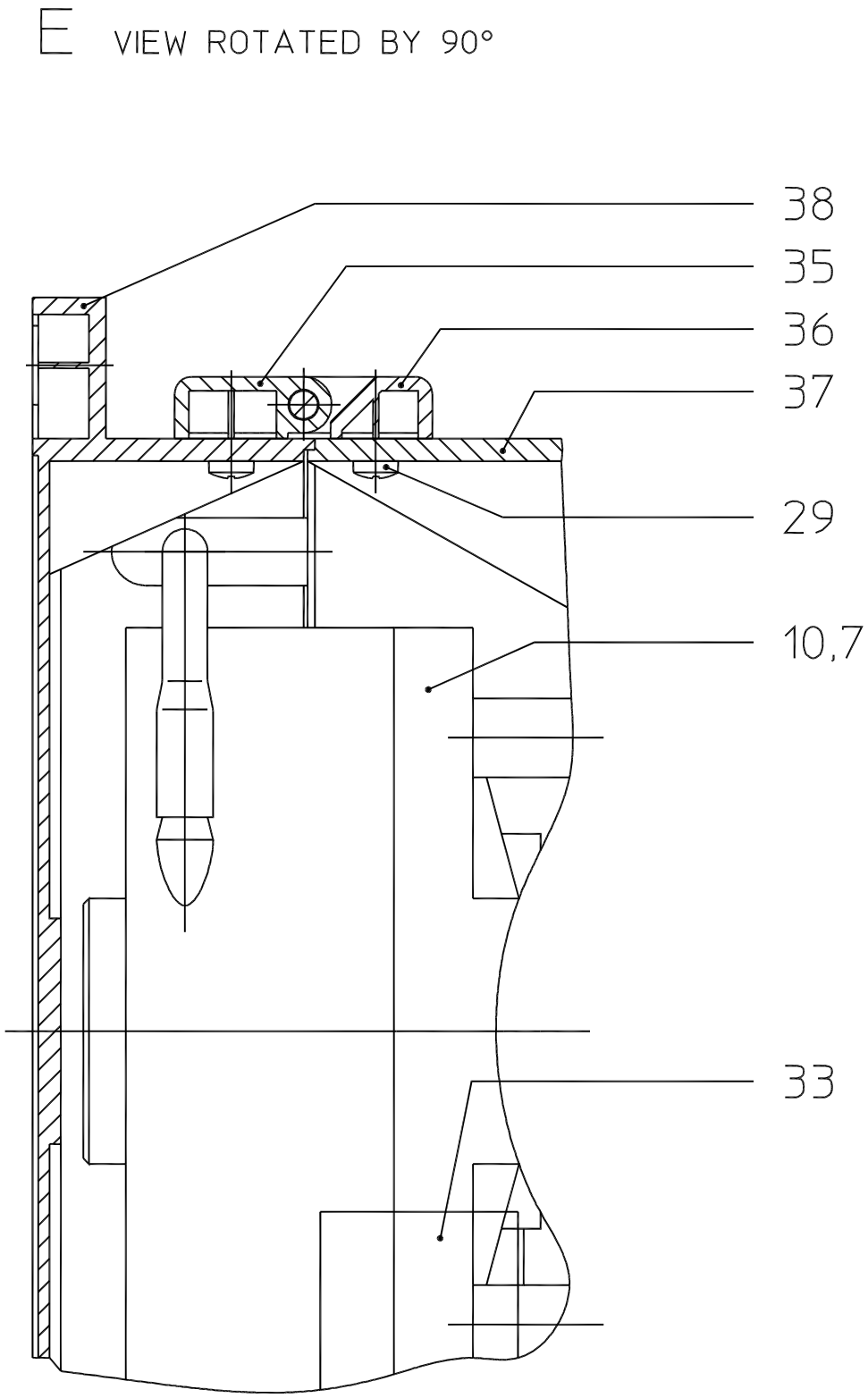


NOTE: FOR PARTS LIST, SEE DWG. 50.560.000.020E.

AAB5383 BARE ELECTRODE RESIDUAL ANALYZER - PARTS

50.560.000.020C

ISSUE 2 6-07



NOTE: FOR PARTS LIST, SEE DWG. 50.560.000.020E.

AAB5383 BARE ELECTRODE RESIDUAL ANALYZER - PARTS

50.560.000.020D

ISSUE 2 6-07

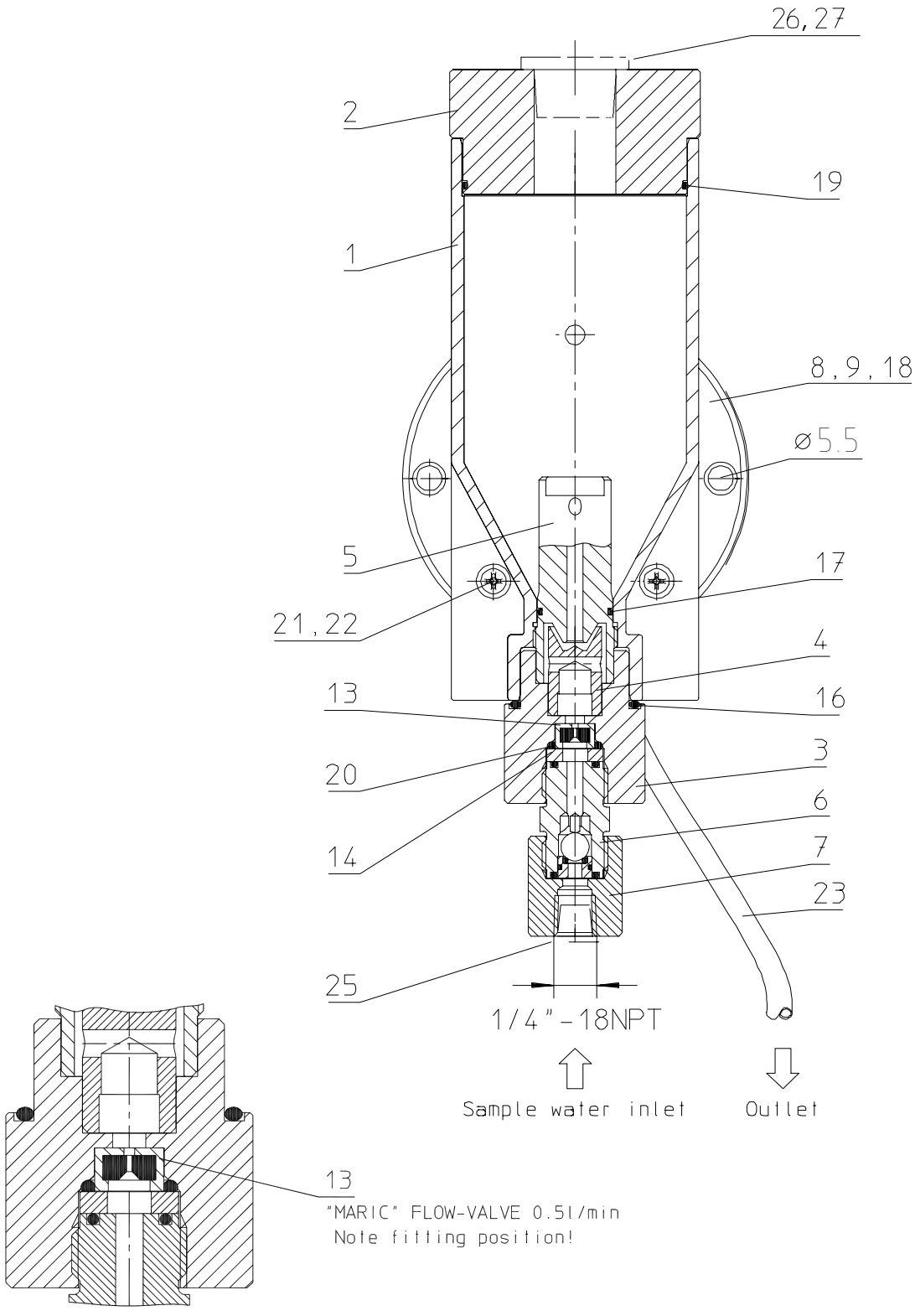
KEY NO.	PART NO.	QTY.	DESCRIPTION
▲ 1	UXB95818	1	ELECTRODE
▲ 2	U95614	1	ELECTRODE
3	U95626	1	ELECTRODE
7	U95641	2	DIAPHRAGM COMPLETE
▲ 9	U95832	1	ELECTRODES PICK UP
10	UXA95648	1	FLOW CONTROL VALVE
14	UXB95656	1	CABLE TERMINAL SCREW
17	UXB95664	1	PLUG UNIT
18	UXA95672	1	CELLULAR CABLE
20	P26234	2	O-RING
22	P92697	6	WASHER
26	P94337	1	O-RING
29	PXA96603	20	EJOT PT-SCREW
30	P96766	1	O-RING
31	PXF94841	2	WASHER
32	PXA95399	1	CABLE CLAMP
33	P95408	1	NAME PLATE
● 34	PXC96112	1	CAP
35	PXA96159	2	HINGE
36	PXB96159	2	HINGE
37	PXA96182	1	HOUSING UPPER PART
38	P96161	1	HOUSING LOWER PART
39	P96714	1	CELLULAR COVER
40	P96931	1	ELECTRODE CASE
41	P96379	1	CELL BLOCK
43	P96206	1	TANK
44	P96207	1	COVER
45	P96208	1	KNURLED NUT
46	P96191	1	NUT
47	P96214	2	CONNECTING PIECE
● 48	P96487	2	CAP
50	PXM96220	4	SCREW
51	PXK96220	2	SCREW
● 53	P96251	1	FELT WASHER
55	P100449	1	O-RING
▲ 56	P100470	1	O-RING
58	PXJ96265	1	CYLINDER PIN
▲ 59	UXA95625	1	PLUG
60	UXA95949	0,031	KCl ELECTROLYTE (PART OF KCl ELECTROLYTE SET)
▲ 61	P39224	6	O-RING

NOTE: ▲ INCLUDED IN ELECTRODE HOUSING.
● ONLY FOR TRANSPORT.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

AAB5383 BARE ELECTRODE RESIDUAL ANALYZER - PARTS LIST

50.560.000.020E
ISSUE 2 6-07



NOTE: FOR PARTS LIST, SEE DWG. 50.560.000.030B.

AAB4390 MEMBRANE FLOW BLOCK ASSEMBLY - PARTS

50.560.000.030A
ISSUE 2 6-07

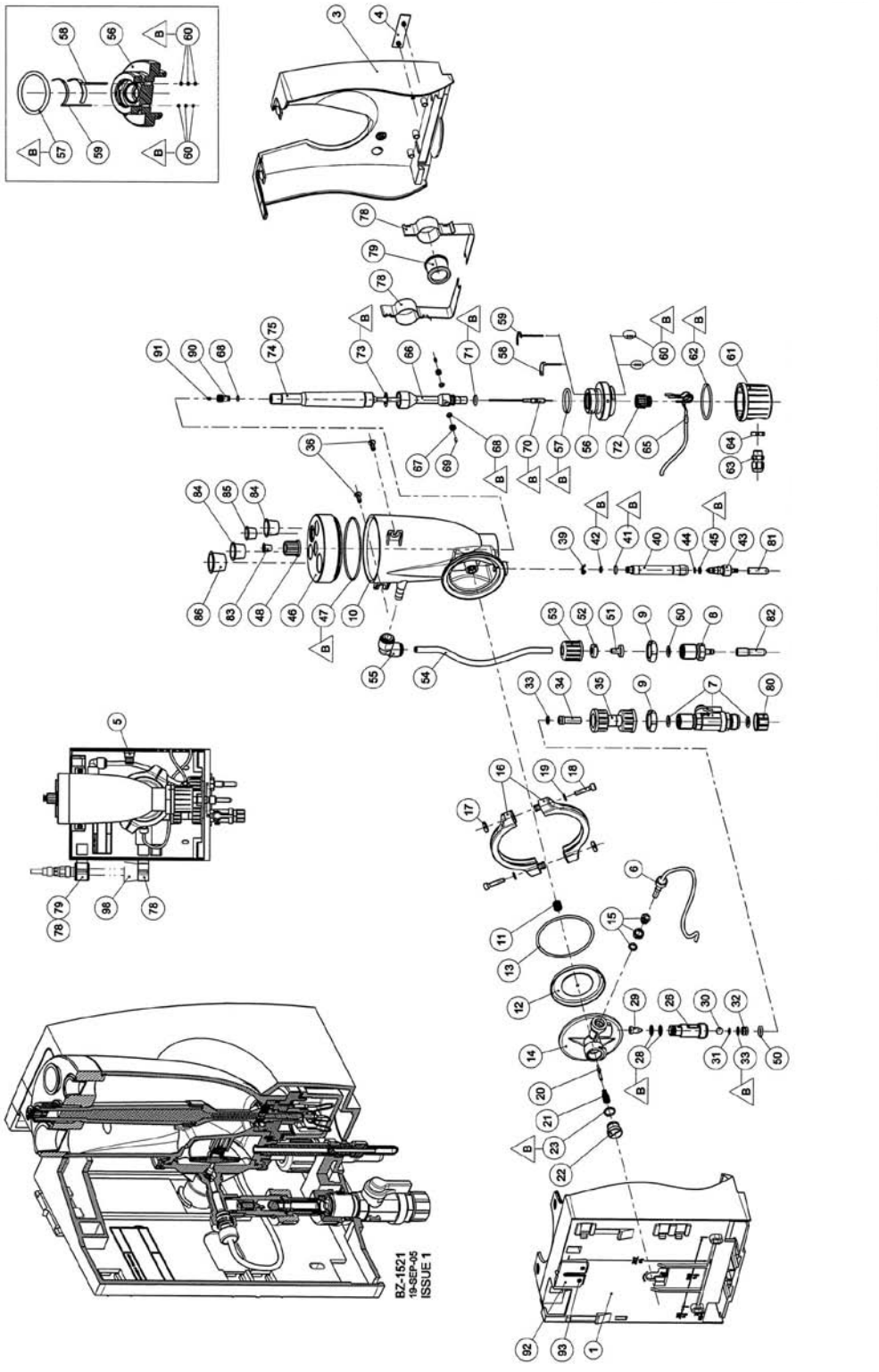
KEY NO.	PART NO.	QTY.	**DESCRIPTION**
1	AAB2161	1	CELL BLOCK
2	AAB1414	1	CELL COVER
5	AAB2461	1	INLET BLOCK
6	UXA95505	1	CHECK VALVE
7	AAB1420	1	ADAPTOR
8	AAA6979	1	EXHAUSTION
9	AAA6877	1	UNION
13	UXC85386	1	FLOW VALVE
14	AAB2164	1	CLAMPING RING
16	P95961	1	O-RING
17	P97226	1	O-RING
18	P26234	1	O-RING
19	P97425	1	O-RING
20	PXA26345	1	O-RING
21	PXK96220	2	SCREW
22	P92697	2	PLAIN WASHER
23	RP9114451	0.3m	TUBE
25	P31459	1	PLUG
26	P34374	1	PLUG
27	P34854	1	PLUG

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

AAB4390 MEMBRANE FLOW BLOCK ASSEMBLY - PARTS LIST

50.560.000.030B

ISSUE 2 6-07



NOTE: FOR PARTS LIST, SEE DWGS. 50.580.000.010B-D.

AAC6208 DEPOLOX® 5 - PARTS

50.580.000.010A
ISSUE 0 10-06

KEY NO.	PART NO.	DESCRIPTION
1	AAC4612	BASE HOUSING
1,92,93	AAC5908	BASE HOUSING, PRE-ASSEMBLED
3	AAC4615	HOUSING COVER
4	AAC5620	PRODUCT ID
5	AAC5374	CABLE CLIP
6	AAC5461	MULTI SENSOR
7	AAC5602	SHUT-OFF VALVE
8	AAC5251	OUTLET CONNECTION
9	AAC4891	LOW CROWN NUT
10	AAC4768	CELL BODY
11	AAA6982	COMPRESSION RING
12	AAC4828	MEMBRANE UNIT
13	AAC4885	O-RING
14	AAC5371	CONTROL VALVE BODY
15	AAC4999	PLASTIC CARTRIDGE
16	AAC4777	V PROFILE CLAMP
17	AAC4801	SQUARE NUT
18	PXE95248	PAN HEAD SCREW
19	P92697	WASHER
20	AAC4840	VALVE NEEDLE
21	P44580G	COMPRESSION RING
22	AAC4843	ADJUSTING SCREW
23	AAA5537	O-RING
26	AAC4774	CHECK VALVE HOUSING
28	P92571	O-RING
29	AAA7051	FLOAT, INCLUDES MAGNET
30	PXA95859	BALL
31	PXA95968	O-RING
32	PXA95234	UNION END
33	PXB95968	O-RING
34	AAC4852	FINE FILTER
33,34	AAC6277	FINE FILTER, COMPLETE
35	AAC5605	FILTER HOUSING
36	AAC5002	PLASTIC SELF-TAPPING SCREW
39	AAC5596	SECURING RING
40	AAC4861	DRAIN TUBE

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS

AAC6208 DEPOLOX® 5 - PARTS LIST

50.580.000.010B

ISSUE 0 10-06

KEY NO.	PART NO.	DESCRIPTION
41	PXC95968	O-RING
42	AAC7126	O-RING
43	AAC4858	DRAIN SCREW
44	AAC9550	FLAT GASKET
45	PXA33051	O-RING
46	AAC4795	CELL BODY COVER
47	AAC4906	O-RING
48	P96191	KNURLED NUT
50	P94734	O-RING
51	PXA95542	HOSE BUSHING
52	AAA6901	LOCKING RING
53	PXA95702	UNION NUT
50-53	UXD95821	HOSE CONNECTION PARTS
54	AAC5599	HOSE
55	AAC4996	REDUCING ELBOW
56	AAC6616	ELECTRODE MOUNT
57	P100470	O-RING
58	UXB95818	WORKING ELECTRODE
59	U95614	COUNTER ELECTRODE
60	P39224	O-RING
61	AAC4786	SEALING CAP
62	P100449	O-RING
63	AAC2779	CABLE UNION
64	AAC2821	HEXAGON NUT
65	AAC6817	CONNECTOR CABLE COMBINATION
66	P96931	ELECTRODE CASE
67-69	U95641	DIAPHRAGM COMPLETE
70	U95626	REFERENCE ELECTRODE
71	P94337	O-RING
72	P96208	KNURLED NUT
73	P96766	FLAT GASKET
74	U95949	KCL ELECTRODE SET, 100ml
75	P96206	CONTAINER
78	AAC5581	CLIP, COATED
79	AAC5662	ELECTRODE MOUNT
80	PXD97335	SCREW CAP

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS

AAC6208 DEPOLOX® 5 - PARTS LIST

50.580.000.010C

ISSUE 0 10-06

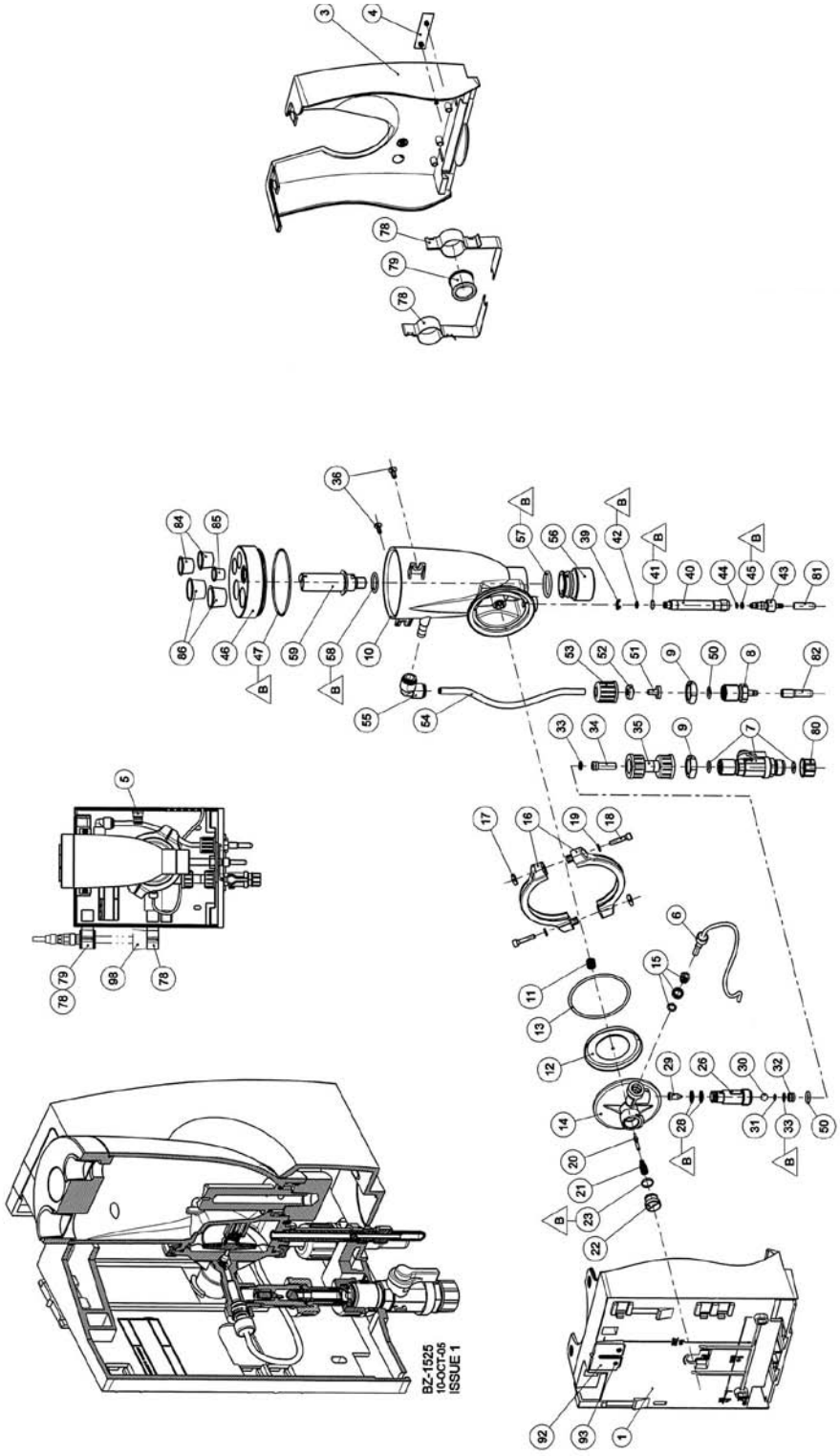
KEY NO.	PART NO.	DESCRIPTION
81	AAC2551	PROTECTION CAP
82	AAC6139	PROTECTION CAP
83	PXC96112	PROTECTION CAP
84	P96487	PROTECTION CAP
85	AAC5926	PROTECTION CAP
86	AAC5929	PROTECTION CAP
68,90,91	UXB95664	PLUG COMPLETE
92	AAC4609	WALL HOOKS
93	PXB94077	SHEET METAL SCREW
98	AAC5587	BREAKER, 1 PC
98	AAC5590	BREAKER, 75 PC
Accessories	P96251	FELT WASHER, TRANSPORT LOCK
Accessories	UXD95821	HOSE CONNECTION PARTS, ID 6 x WDG 1
Accessories	UXA92119	HOSE CONNECTION PARTS, ID 6 x WDG 3
Accessories	AAD4198	ELECTRODE CLEANING SAND “QK”
Accessories	UXA95775	MOUNTING SET

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS

AAC6208 DEPOLOX® 5 - PARTS LIST

50.580.000.010D

ISSUE 0 10-06



NOTE: FOR PARTS LIST, SEE DWGS. 50.580.000.020B&C.

AAD4165 VARIASENS™ - PARTS

50.580.000.020A
ISSUE 0 10-06

KEY NO.	PART NO.	DESCRIPTION
1	AAC4612	BASE HOUSING
1,92,93	AAC5908	BASE HOUSING, PRE-ASSEMBLED
3	AAC4615	HOUSING COVER
4	AAD4372	PRODUCT ID
5	AAC5374	CABLE CLIP
6	AAC5461	MULTI SENSOR
7	AAC5602	SHUT-OFF VALVE
8	AAC5251	OUTLET CONNECTION
9	AAC4891	LOW CROWN NUT
10	AAC4768	CELL BODY
11	AAA6982	COMPRESSION RING
12	AAC4828	MEMBRANE UNIT
13	AAC4885	O-RING
14	AAC5371	CONTROL VALVE BODY
15	AAC4999	PLASTIC CARTRIDGE
16	AAC4777	V PROFILE CLAMP
17	AAC4801	SQUARE NUT
18	PXE95248	PAN HEAD SCREW
19	P92697	WASHER
20	AAC4840	VALVE NEEDLE
21	P44580G	COMPRESSION RING
22	AAC4843	ADJUSTING SCREW
23	AAA5537	O-RING
26	AAC4774	CHECK VALVE HOUSING
28	P92571	O-RING
29	AAA7051	FLOAT, INCLUDES MAGNET
30	PXA95859	BALL
31	PXA95968	O-RING
32	PXA95234	UNION END
33	PXB95968	O-RING
34	AAC4852	FINE FILTER
33,34	AAC6277	FINE FILTER, COMPLETE
35	AAC5605	FILTER HOUSING
36	AAC5002	PLASTIC SELF-TAPPING SCREW
39	AAC5596	SECURING RING
40	AAC4861	DRAIN TUBE

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS

AAD4165 VARIASENS™ - PARTS LIST

50.580.000.020B

ISSUE 0 10-06

KEY NO.	PART NO.	DESCRIPTION
41	PXC95968	O-RING
42	AAC7126	O-RING
43	AAC4858	DRAIN SCREW
44	AAC9550	FLAT GASKET
45	PXA33051	O-RING
46	AAD4147	CELL BODY COVER
47	AAC4906	O-RING
50	P94734	O-RING
51	PXA95542	HOSE BUSHING
52	AAA6901	LOCKING RING
53	PXA95702	UNION NUT
50-53	UXD95821	HOSE CONNECTION PARTS
54	AAC5599	HOSE
55	AAC4996	REDUCING ELBOW
56	AAD4153	PRESS-OUT PLUG
57	P100470	O-RING
58	AAB2290	O-RING
59	AAD4150	FLOW BODY
78	AAC5581	CLIP, COATED
79	AAC5662	ELECTRODE MOUNT
80	PXD97335	SCREW CAP
81	AAC2551	PROTECTION CAP
82	AAC6139	PROTECTION CAP
84	P96487	PROTECTION CAP
85	AAC5926	PROTECTION CAP
86	AAC5929	PROTECTION CAP
92	AAC4609	WALL HOOKS
93	PXB94077	SHEET METAL SCREW
98	AAC5587	BREAKER, 1 PC
98	AAC5590	BREAKER, 75 PC
Accessories	UXD95821	HOSE CONNECTION PARTS, ID 6 x WDG 1
Accessories	UXA92119	HOSE CONNECTION PARTS, ID 6 x WDG 3
Accessories	UXA95775	MOUNTING SET

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS

AAD4165 VARIASENS™ - PARTS LIST

50.580.000.020C

ISSUE 0 10-06

SECTION 6 - SPARE PARTS LIST

List Of Contents

PARA. NO.

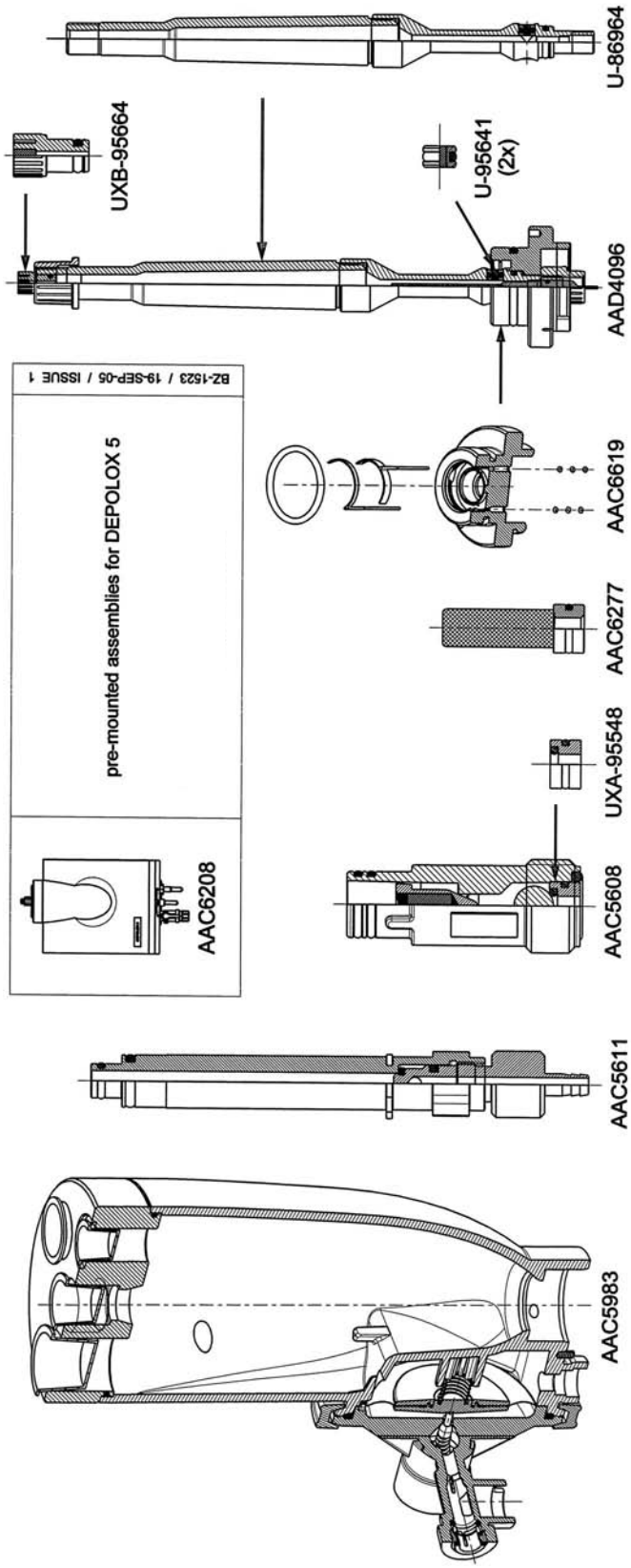
6.1 Free Chlorine (Bare Electrode) Sensor Kit

DESCRIPTION	PART NO.
Spare part set for two years operation	UXA96819
Spare part set for five years operation	UXB96819
Individual spare parts:	
Electrode housing (with working and counter electrode)	U95827
Membrane (two required)	U95641
Electrolyte for reference electrode	UXA95949
Grit (25 g)	U96820
PT100 Temperature Sensor	U95624

6.2 Membrane Sensor Kit

DESCRIPTION	PART NO.
Mem Sen Pack TCl (Total Chlorine) PM Kit (includes membrane cap, elastomer seal, O-ring, electrolyte, abrasive paper, instruction)	AAB1534
Mem Sen Pack FC1 (Free Chlorine) PM Kit	AAC5737
Mem Sen Pack OZ7 (Ozone) PM Kit	AAC5743
Mem Sen Pack CD7 (Chlorine Dioxide) PM Kit	AAC5740
2m Cable	AAC4681
5m Cable	AAC4687
10m Cable	AAC4690
15m Cable	AAC4693
25m Cable	AAC5812
50m Cable	AAC5815
Bare Electrode	AAC6208
VariaSens™ Retrofit Set	AAD4165

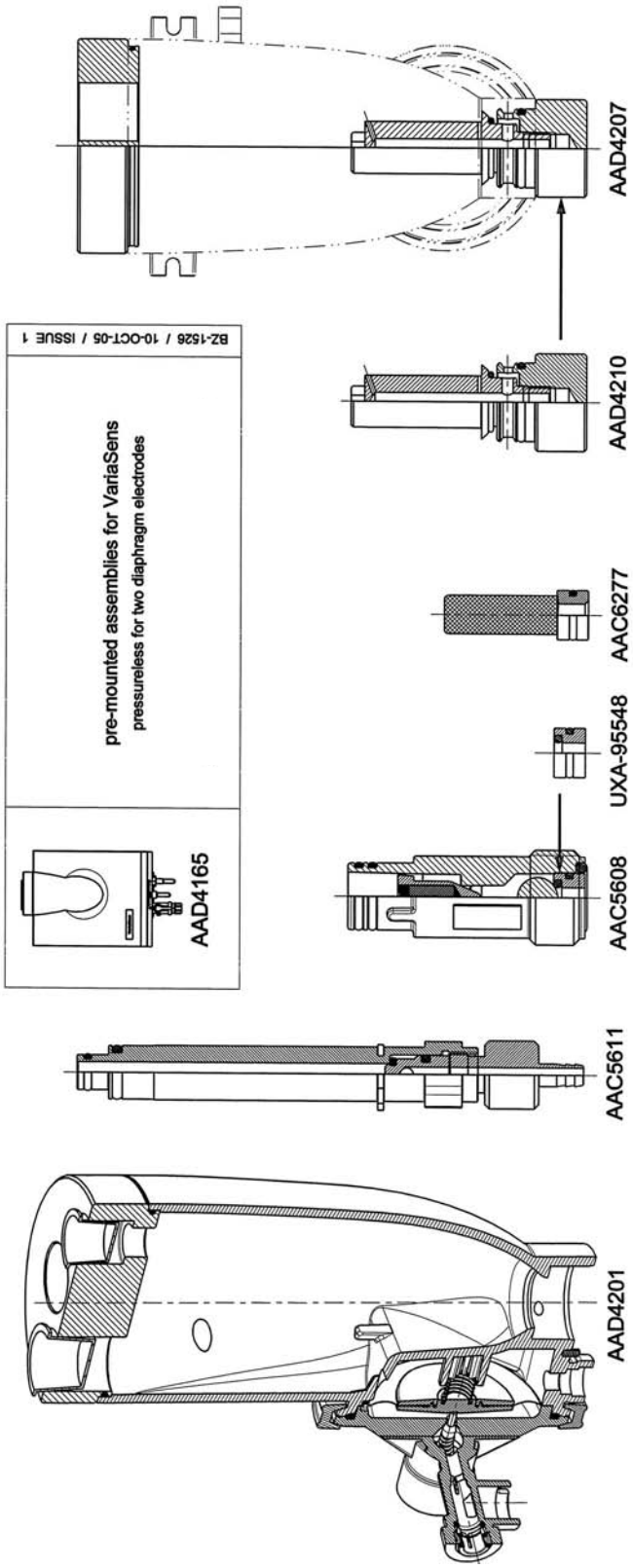
6.2.1 Bare Electrode Retrofit Set AAC6208



6.2.1.1 Bare Electrode Retrofit Set Parts List AAC6208

Part. No.	Description
AAC6208	Flow block assembly
AAC5983	Cell body D5-DL, complete
AAC5611	Drain unit
AAC5608	Back pressure unit
UXA95548	Ball seat, complete
AAC6277	Fine filter
AAC6619	Electrode support, complete
AAD4096	Electrode cell, complete, electrode not included
UXB95664	Plug complete
U95641	Diaphragm complete
U86964	Electrode housing
AAC7078	D5-DL accessory set
AAC7084	Spare parts set, BASIS-KIT
AAC7183	Spare parts set, 2 years Operation
AAC7204	Spare parts set, 5 years Operation

6.2.2 VariaSens™ Retrofit Set AAD4165



6.2.2.1 VariaSens™ Retrofit Set Parts List AAD4165

Part. No.	Description
AAD4165	Flow block assembly
AAD4201	Cell body VS-DL, complete
AAC5611	Drain unit
AAC5608	Back pressure unit
UXA95548	Ball seat, complete
AAC6277	Fine filter
AAD4210	Flow body, complete
AAD4207	Retrofit kit D5-DL/VS-DL
AAC4204	VS-DL accessory set
AAC7084	Spare parts set, BASIS-KIT
AAD4336	Spare parts set, 2 years Operation
AAD4339	Spare parts set, 5 years Operation

6.3 pH Sensor Kit

DESCRIPTION	PART NO.
Complete pH Sensor Kit (U95690 & U93838)	AAB5386
pH sensor	U95690
Impedance transformer (optional)	U95607

6.4 Fluoride Sensor Kit

DESCRIPTION	PART NO.
Complete Refillable Fluoride Sensor Kit (U95799, U93838 & U95607)	AAB5389
Refillable Fluoride sensor	U95799
Complete Gel Fluoride Sensor Kit (AAC5567, U93838 & U95607)	AAC5570
Gel Fluoride sensor	AAC5567
Impedance transformer	U95607
100 mg/l calibration solution	U22777
Fluoride filling solution	AAC5132

6.5 Fluoride/pH Cables

DESCRIPTION	PART NO.
Fluoride/pH Cable - 1.5m	U93838
Fluoride/pH Cable - 5m	UXA93838
Fluoride/pH Cable - 10m	UXB93838
Fluoride/pH Cable - 15m	UXC93838