Operator Manual

POLYMETRON 9123
pH CALCULATOR

221=191=023 - Revision A - 04/09/2007

HACH ULTRA™

EXCELLENCE IN PROCESS ANALYTICS

Product Recycling Information

ENGLISH

Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

Note: *For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.*

DEUTSCH

Elektrogeräte, die mit diesem Symbol gekennzeichnet sind, dürfen in Europa nach dem 12. August 2005 nicht mehr über die öffentliche Abfallentsorgung entsorgt werden. In Übereinstimmung mit lokalen und nationalen europäischen Bestimmungen (EU-Richtlinie 2002/96/EC), müssen Benutzer von Elektrogeräten in Europa ab diesem Zeitpunkt alte bzw. zu verschrottende Geräte zur Entsorgung kostenfrei an den Hersteller zurückgeben.

Hinweis: *Bitte wenden Sie sich an den Hersteller bzw. an den Händler, von dem Sie das Gerät bezogen haben, um Informationen zur Rückgabe des Altgeräts zur ordnungsgemäßen Entsorgung zu erhalten.*

FRANCAIS

A partir du 12 août 2005, il est interdit de mettre au rebut le matériel électrique marqué de ce symbole par les voies habituelles de déchetterie publique. Conformément à la réglementation européenne (directive UE 2002/96/EC), les utilisateurs de matériel électrique en Europe doivent désormais retourner le matériel usé ou périmé au fabricant pour élimination, sans frais pour l'utilisateur.

Remarque: *Veuillez vous adresser au fabricant ou au fournisseur du matériel pour les instructions de retour du matériel usé ou périmé aux fins d'élimination conforme.*

ITALIANO

Le apparecchiature elettriche con apposto questo simbolo non possono essere smaltite nelle discariche pubbliche europee successivamente al 12 agosto 2005. In conformità alle normative europee locali e nazionali (Direttiva UE 2002/96/EC), gli utilizzatori europei di apparecchiature elettriche devono restituire al produttore le apparecchiature vecchie o a fine vita per lo smaltimento senza alcun costo a carico dell'utilizzatore.

Nota: *Per conoscere le modalità di restituzione delle apparecchiature a fine vita da riciclare, contattare il produttore o il fornitore dell'apparecchiatura per un corretto smaltimento.*

DANSK

Elektriske apparater, der er mærket med dette symbol, må ikke bortskaffes i europæiske offentlige affaldssystemer efter den 12. august 2005. I henhold til europæiske lokale og nationale regler (EU-direktiv 2002/96/EF) skal europæiske brugere af elektriske apparater nu returnere gamle eller udtjente apparater til producenten med henblik på bortskaffelse uden omkostninger for brugeren.

Bemærk: *I forbindelse med returnering til genbrug skal du kontakte producenten eller leverandøren af apparatet for at få instruktioner om, hvordan udtjente apparater bortskaffes korrekt.*

SVENSKA

Elektronikutrustning som är märkt med denna symbol kanske inte kan lämnas in på europeiska offentliga sopstationer efter 2005-08-12. Enligt europeiska lokala och nationella föreskrifter (EU-direktiv 2002/96/EC) måste användare av elektronikutrustning i Europa nu återlämna gammal eller utrangerad utrustning till tillverkaren för kassering utan kostnad för användaren.

Obs! *Om du ska återlämna utrustning för återvinning ska du kontakta tillverkaren av utrustningen eller återförsäljaren för att få anvisningar om hur du återlämnar kasserad utrustning för att den ska bortskaffas på rätt sätt.*

ESPANOL

A partir del 12 de agosto de 2005, los equipos eléctricos que lleven este símbolo no deberán ser desechados en los puntos limpios europeos. De conformidad con las normativas europeas locales y nacionales (Directiva de la UE 2002/96/EC), a partir de esa fecha, los usuarios europeos de equipos eléctricos deberán devolver los equipos usados u obsoletos al fabricante de los mismos para su reciclado, sin coste alguno para el usuario.

Nota: *Sírvase ponerse en contacto con el fabricante o proveedor de los equipos para solicitar instrucciones sobre cómo devolver los equipos obsoletos para su correcto reciclado.*

NEDERLANDS

Elektrische apparatuur die is voorzien van dit symbool mag na 12 augustus 2005 niet meer worden afgevoerd naar Europese openbare afvalsystemen. Conform Europese lokale en nationale wetgegeving (EU-richtlijn 2002/96/EC) dienen gebruikers van elektrische apparaten voortaan hun oude of afgedankte apparatuur kosteloos voor recycling of vernietiging naar de producent terug te brengen.

Nota: *Als u apparatuur voor recycling terugbrengt, moet u contact opnemen met de producent of leverancier voor instructies voor het terugbrengen van de afgedankte apparatuur voor een juiste verwerking.*

POLSKI

Sprzęt elektryczny oznaczony takim symbolem nie może być likwidowany w europejskich systemach utylizacji po dniu 12 sierpnia 2005. Zgodnie z europejskimi, lokalnymi i państwowymi przepisami prawa (Dyrektywa Unii Europejskiej 2002/96/EC), użytkownicy sprzętu elektrycznego w Europie muszą obecie przekazywać Producentowi stary sprzęt lub sprzęt po okresie użytkowania do bezpłatnej utylizacji.

Uwaga: *Aby przekazać sprzęt do recyklingu, należy zwrócić się do producenta lub dostawcy sprzętu w celu uzyskania instrukcji dotyczących procedur przekazywania do utylizacji sprzętu po okresie użytkowania.*

PORTUGUES

Qualquer equipamento eléctrico que ostente este símbolo não poderá ser eliminado através dos sistemas públicos europeus de tratamento de resíduos sólidos a partir de 12 de Agosto de 2005. De acordo com as normas locais e europeias (Directiva Europeia 2002/96/EC), os utilizadores europeus de equipamentos eléctricos deverão agora devolver os seus equipamentos velhos ou em fim de vida ao produtor para o respectivo tratamento sem quaisquer custos para o utilizador.

Nota: *No que toca à devolução para reciclagem, por favor, contacte o produtor ou fornecedor do equipamento para instruções de devolução de equipamento em fim de vida para a sua correcta eliminação.*

Product Disposal

Note:
The following only applies to European customers.

Hach Ultra is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) that came into force on August 13 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment.

In conformity with European local and national regulations (EU Directive 2002/96/EC stated above), electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12 August 2005.

Hach Ultra will offer to take back (**free of charge to the customer**) any old, unserviceable or redundant analyzers and systems which carry the above symbol, and which were originally supplied by Hach Ultra. Hach Ultra will then be responsible for the disposal of this equipment.

In addition, Hach Ultra will offer to take back (**at cost to the customer**) any old, unserviceable or redundant analyzers and systems which do not carry the above symbol, but which were originally supplied by Hach Ultra. Hach Ultra will then be responsible for the disposal of this equipment.

Should you wish to arrange for the disposal of any piece of equipment originally supplied by Hach Ultra, please contact your supplier or our After Sales Service department in Geneva for instructions on how to return this equipment for proper disposal.

Restriction of Hazardous Substances

Note:
The following only applies to exports of the product into the People's Republic of China.

Marking 标记

Products contain toxic or hazardous substances or elements.
含有有毒或者危险物质及成分的产品。

Environment Protection Use Period Marking (years).
环保使用期限标记（年）

	Toxic or Hazardous Substances and Elements 有毒或者危险物质和成分					
Part Name 部件名称	**Lead (Pb) 铅**	**Mercury (Hg) 汞**	**Cadmium (Cd) 镉**	**Hexavalent Chromium (Cr VI) 六价铬**	**Polybrom Biphenyls (PBB) 多溴联苯**	**Polybrom Diphenyls (PBDE) 多溴联苯醚**
Transmitter box	X					
CPU PCB	O				O	
Power PCB	O				O	
Relay PCB	O				O	
Module	O					

O: Indicates that this toxic or hazardous substance contained in all homogeneous material for this part is below the limit requirement
表示所有此类部件的材料中所含有毒或危险物质低于限制要求

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement
表示至少有一种此类部件材料中所含有毒或危险物质高于限制要求

Table of Contents

Appendix C: Material Safety Data Sheets (MSDS)

Manual Overview

About This Manual

The information in this manual has been carefully checked and is believed to be accurate. However, Hach Ultra assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will Hach Ultra be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. In the interest of continued product development, Hach Ultra reserves the right to make improvements in this manual and the products it describes at any time, without notice or obligation.

Published in Europe.

This manual can be ordered separately by ordering part number 621=191=023 from your local Hach Ultra representative.

Revision History

- Revision A, January 2007, Hach Ultra

Safety Precautions

Please read the entire manual before unpacking, setting up, or operating this instrument.

Pay particular attention to all warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

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

Safety Conventions

WARNING

In this manual, a warning is used to indicate a condition which, if not met, could cause serious personal injury and/or death. Do not move beyond a warning until all conditions have been met. If this warning sign appears on the instrument itself, refer to “Precautionary Labels” on page 7 *for an explanation.*

CAUTION:

A caution is used to indicate a condition which, if not met, could cause minor or moderate personal injury and/or damage to the equipment. Do not move beyond a caution until all conditions have been met.

Note:

A note is used to indicate important information or instructions that should be considered before operating the equipment.

Safety Recommendations

For safe operation, it is imperative that these service instructions be read before use and that the safety recommendations mentioned herein be scrupulously respected. If danger warnings are not heeded to, serious material or bodily injury could occur.

WARNING

The installation of the instrument should be performed exclusively by personnel specialized and authorized to work on electrical installations, in accordance with relevant local regulations.

CAUTION:

This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Service and Repairs

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

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

Potential Safety Hazards

The following potential safety hazards are associated with operating the analyzer:

- Electrical (line voltage)
- Potentially hazardous chemicals

Precautionary Labels

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

	This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and/or death. The user should reference this instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
	This symbol, when noted on the product, indicates that the marked item can be hot and should not be touched without care.
	This symbol, when noted on the product, indicates the presence of devices sensitive to electrostatic discharge and indicates that care must be taken to prevent damage to them.
	This symbol, when noted on the product, identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations, European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.
	This symbol, if noted on the product, indicates the need for protective eye wear.
	This symbol, if noted on the product, indicates the need for protective glove wear.
	This symbol, when noted on the product, identifies the location of the connection for protective earth (ground).

1 Overview

1.1 General

The system is available as either a stand-alone transmitter or as a complete analyzer including the transmitter.

1.2 Description of the Transmitter

Fig 1-1: Transmitter

The Polymetron 9123 Dual Channel Transmitter has been designed for calculating pH and for continuous conductivity, resistivity, and temperature measurements in industrial processes.

The easy to use (installation and programming) transmitter is equipped with a microprocessor and can be configured to function in numerous applications in the following industry sectors:

- measurement in pure and ultrapure water, power plants, semiconductor industry, pharmaceutical.
- drinking water
- industrial processes (chemistry, paper mills, sugar refineries, etc.)

The transmitter needs to be connected to an appropriate sensor via a cable.

1.3 Description of the Analyzer

1.3.1 Schematic

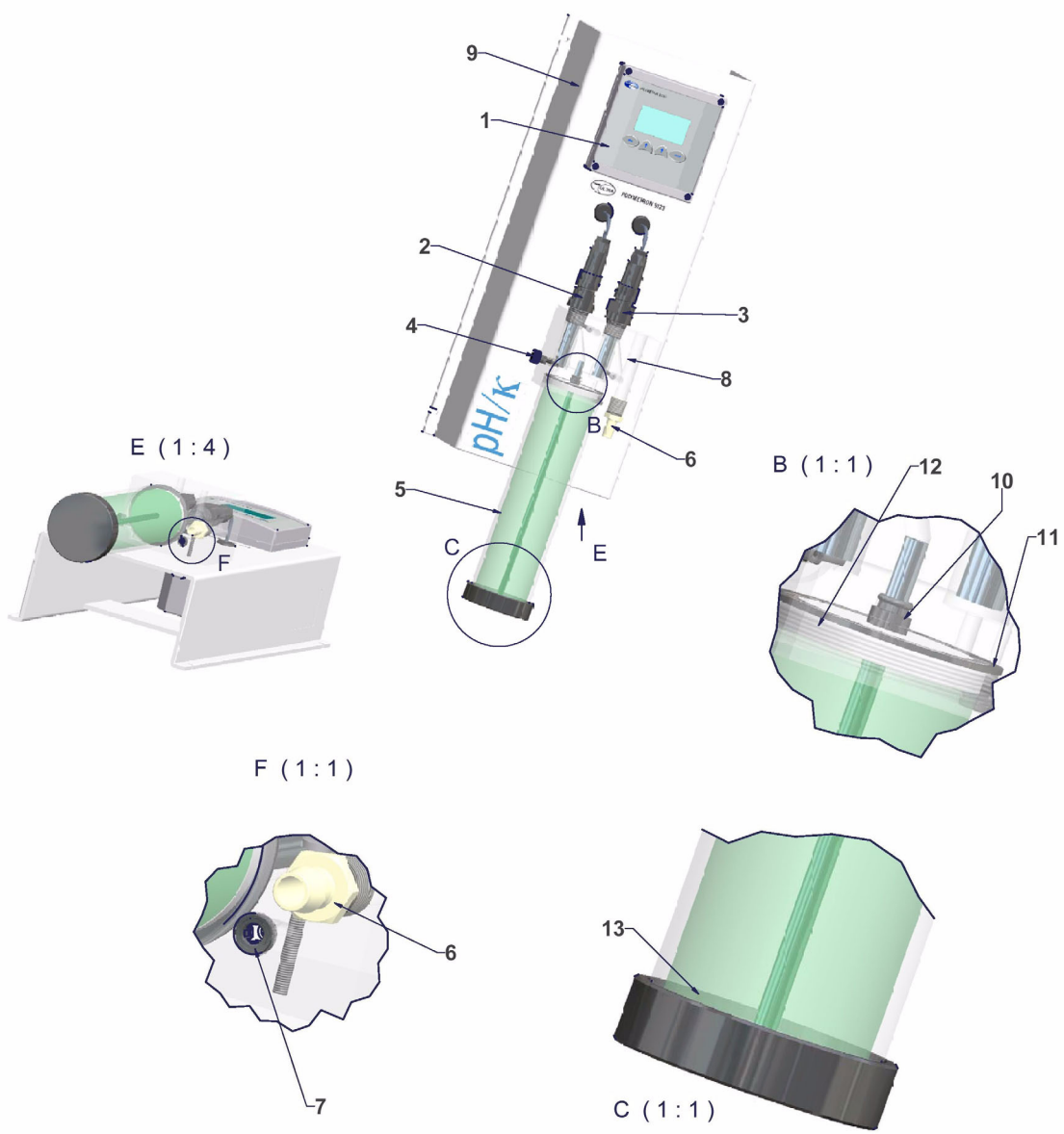


Fig 1-2: Analyzer Components

1. 9123 transmitter	8. Measurement cell
2. Channel 1 conductivity probe	9. Mounting panel
3. Channel 2 conductivity probe	10. Quick lock with 316SS tube
4. Sample flow adjustment valve	11. Viton flat gasket
5. Cationic resin cartridge	12. Filter
6. Sample output	13. Spreader
7. Sample input	

1.3.2 Principle of Operation (pH calculation)

The Polymetron 9123 analyzer adheres to the recommendations contained in the guidelines for feedwater, boiler water and steam quality for power and industrial plants (VGB-R 450 second edition 2004).

Note:
The pH calculations can only be applied under the following strict chemical conditions:

- *the sample must only contain an alkaline agent (ammonia, sodium hydroxide or ethanolamine)*
- *any impurity is principally NaCl (sodium chloride)*
- *the concentration of impurity must be negligible in comparison to the alkaline agent*

Control of Conductivity Values

Control of the minimum and maximum conductivity values depends upon the volatile conditioner (AVT) and the alarm level 2 (AL2) as described in the VGB 450L document. These values are illustrated in the following two tables.

Note:
AVT (All Volatile Treatment - Conditioning concept where only volatile alkalizing agents are used; mainly ammonia).

NH3 Conditioner	
	AVT
pH	9 - 10.0
Conductivity C1 (µS/cm)	2.8 - 28
Acid conductivity C2 (µS/cm)	< 0.5

NaOH Conditioner	
Pressure	**< 4 bars**
pH	9 - 10.7
Conductivity C1 (µS/cm)	2.5 - 125
Acid conductivity C2 (µS/cm)	< 100

1.4 Principle of Electrolytic Conductivity

Ohm’s law specifies that the current circulating in the dipole is proportional to the difference in potential and resistance of this dipole:

$$I = E / R$$

The resistance of a homogenous environment depends on the geometry of the resistivity (characteristic of the material):

$$R = r . 1/K$$

Where "r" is the resistivity in Ohm.cm and "K", the cell constant in cm-1.

1.5 Conductivity Measurement

The electric conductivity measures the transport of electric charges in any field. In metal conductors, the current flows by transport of electrons, whereas in solutions, it flows by transport of ions such as Na+ and Cl- which ensure the transport of charges. The higher the transport of charges is, the greater is the conductance of the solution.

The conductivity of a solution is an expression of the capacity of that solution to conduct an electric current.

In solution, conductivity is much more complicated than in conductors because several species ensure the transport of charges. For instance, in drinking water the conductive species registered are sodium, calcium, magnesium, ferrous cations, ferrites, phosphates and nitrate ions. For slightly concentrated solutions, the concentration of H^+ protons and hydroxyl OH^- ions (stemming from the weak dissociation of the water $[H^+] = [OH^-] = 10^{-7}$ mol/L to 25°C) can no longer be neglected in the presence of the product, this therefore leads to a non-linear variation Conductivity/Concentration.

Mobility of these species in an electric field depends naturally on their size, weight, transport charge, viscosity of the field. The greater the concentration of the species is, the greater the interactions between these ionic species is.

1.6 Measurement of pH by Differential Conductivity

Measurement of pH in environments of low conductivity using the standard potentiometric method (glass electrode + reference) is extremely delicate and not very accurate because it is proportional to the concentration logarithm. It also requires a more frequent calibration to compensate for variations in the measurement chain (junction potential, degradation of the glass membrane).

On the other hand, measurement of conductivity in these environments is a lot more reliable and more accurate as it is directly proportional to the concentration in impurity, and in addition requires little or no maintenance.

Therefore, given the relationship between the pH and conductivity of a product, the conductivity measurement can be used to determine a precise pH.

If the product contains impurities (generally in the form of salts), this calculation cannot be applied. The principle is then to transform the salt into acid by passing it through a cationic resin and, given the relationship of the conductivity between the acid and the corresponding salt (always around 3), to determine the conductivity originating only from the conditioner:

ΔC = Conductivity before resin (C1) – Conductivity after resin (C2) / A

and

ph = f(ΔC)

Note:
The calculated pH is the pH of the sample at the analyzer inlet (channel 1). The 9123 analyzer does not calculate the pH downstream of the resin cartridge.

1.7 Frequency Adjustment

In order to optimize the measurement precision when using long cables to connect the conductivity sensor to the instrument, three measurement frequencies are available:

- a frequency of 100 Hz for measurements with long cables (100m)
- a frequency of 500 Hz for measurements with medium length cables (50m)
- a frequency of 1000 Hz for measurements with short cables (10m)

These frequencies can be programmed into the transmitter (see the section entitled “PROBE” on page 39 for details).

For model 9123=A=1000 (the analyzer), the default frequency value is set at 1000 Hz. For model 9123=A=0000 (transmitter only), the frequency adjustment is mandatory and must be made according to the cable length.

1.8 Ion Exchange Resin - Life Expectancy

To determine the effectiveness of the ion exchange resin in the cartridge, it is necessary to know the flow rate of the sample. This information is then entered into the system by the user to enable the system to calculate the resin life expectancy (refer to the screens and explanation given in “RESIN Option” on page 47).

A warning message will be displayed to alert the user when the resin is nearing the end of its effective life (i.e. less than 10 days). A system alarm will then be activated when this timer runs down to 0 days unless the resin has been changed and the life expectancy recalculated (refer also to the explanation given in “RESIN Option” on page 47).

2 Installation

WARNING

The instrument should only be assembled by qualified staff. Mains power should only be connected once installation has been completed and checked.

2.1 Inspection

The instrument has been factory tested and checked prior to shipping. We nevertheless recommend that you perform a visual inspection in order to ensure that it has not been damaged. Any marked packaging is a potential sign of damage that may not be immediately visible. Keep all packaging in the event of claims. If any parts or accessories are missing, refer to your distributor or to Hach Ultra.

2.2 Unpacking

The instrument should be unpacked carefully. Make sure that no accessories are lost during unpacking. Inside the package is a check list that lists the total contents of the package. Verify that the contents of the package (and serial numbers where applicable) correspond to this list. If any parts or accessories are missing, or there is a mismatch of serial numbers, refer to your distributor or to Hach Ultra.

2.3 General Installation Considerations

- Place the transmitter in an accessible location, preferably above eye-level allowing an unrestricted view of the display and controls
- Vibrations are not excessive
- Choose a site where access to the instrument is easy
- Keep the sample tubing as short as possible to minimize lag time.
- Do not place the sensor next to a heat source.
- Ensure there is no air intrusion into the sample supply line.

2.4 Check Lists

2.4.1 Installation

1) For the transmitter see “Mechanical Installation of the Transmitter” on page 16 and for the analyzer see “Mechanical Installation of the Analyzer” on page 19.
2) Followed for both by “Electrical Connections” on page 21
3) And then “Sensor Connections” on page 24

2.4.2 Start-up

1) Post-installation procedures (see “Post-Installation Procedures” on page 25)
2) Configuration (see section “PROGRAMMING Menu” on page 38) - includes type of probe and settings, alarms, mA outputs, etc.
3) Additional configuration settings (see section “SERVICE Menu” on page 45) - including measurement averaging, display, resin management, etc.
4) Calibration (see section “CALIBRATION Menu” on page 31)

2.5 Mechanical Installation of the Transmitter

2.5.1 Transmitter Dimensions

If the complete analyzer (model 9123=A=1000) has been purchased, rather than just the transmitter (model 9123=A=0000), ignore this section and proceed to “Mechanical Installation of the Analyzer” on page 19.

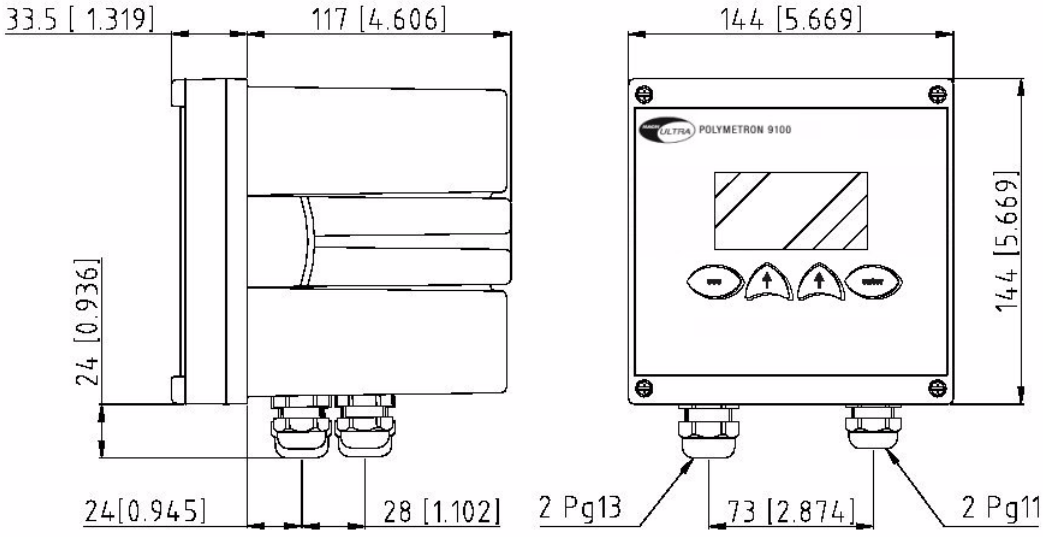


Fig 2-1: Transmitter Dimensions in mm [inches]

2.5.2 Mounting the Transmitter

The transmitter can be mounted in one of the following ways:

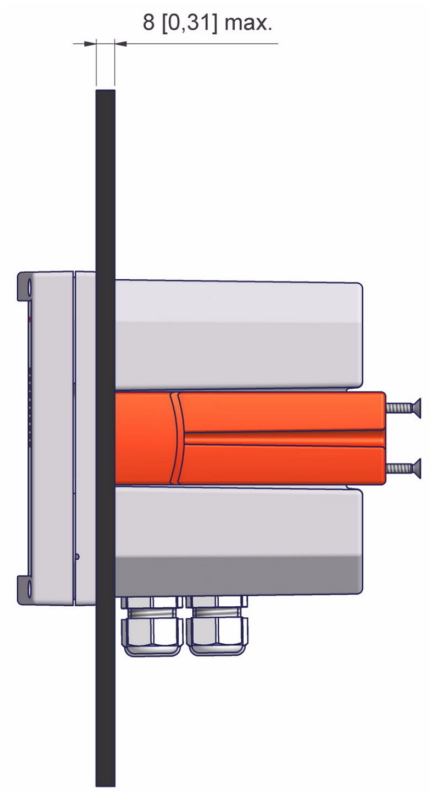
- Panel
- Wall
- Tube/Pipe

A red fixing bracket is attached to the transmitter and is used for the wall and tube/pipe installations. It is not necessary for the panel installation.

In the following transmitter installation diagrams, the figures shown are in mm [inches].

Note:
The transmitter housing conforms to the DIN 43700 standard.

2.5.2.1 Panel Mounting

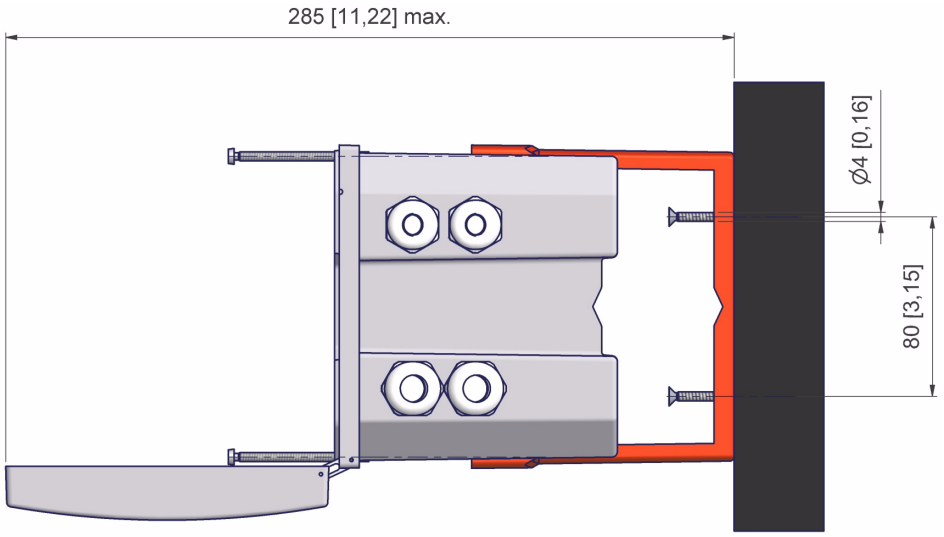


- Panel cut-out:138 X 138 mm [5.4” x 5.4”]
- Front dimensions:144 x 144 mm [5.8” x 5.8”]
- Panel thickness:8 mm [0.31”] maximum

Note:
Requires 2 x ∅4 mm, 16 mm length flat head screws (provided), for panel thickness 1 to 4 mm
Requires 2 x ∅4 mm, 20 mm length flat head screws (provided), for panel thickness 4 to 8 mm

Fig 2-2: Panel Mount

2.5.2.2 Wall Mounting

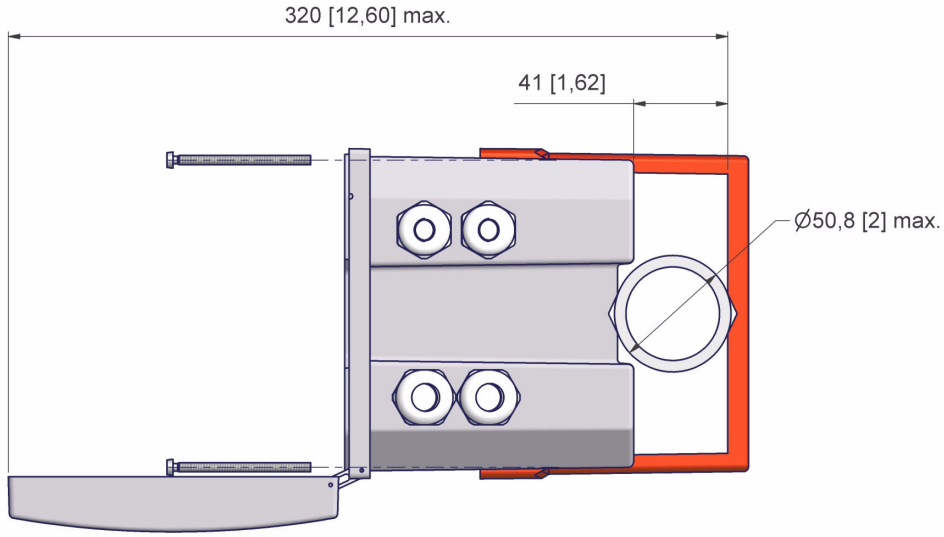


- Center distance:80 mm [3.15”]

Note:
Requires 2 x ∅4 mm, 60 mm length flat head screws (not provided)

Fig 2-3: Wall Mount

2.5.2.3 Tube/Pipe Mounting



- Tube/pipe diameter:50.8 mm [2”] maximum

Note:
Requires 2 x ∅4 mm, 60 mm length screws (provided)

Fig 2-4: Tube Mount

2.6 Mechanical Installation of the Analyzer

If only the transmitter has been purchased, ignore this section and proceed to “Electrical Connections” on page 21.

2.6.1 Analyzer Dimensions

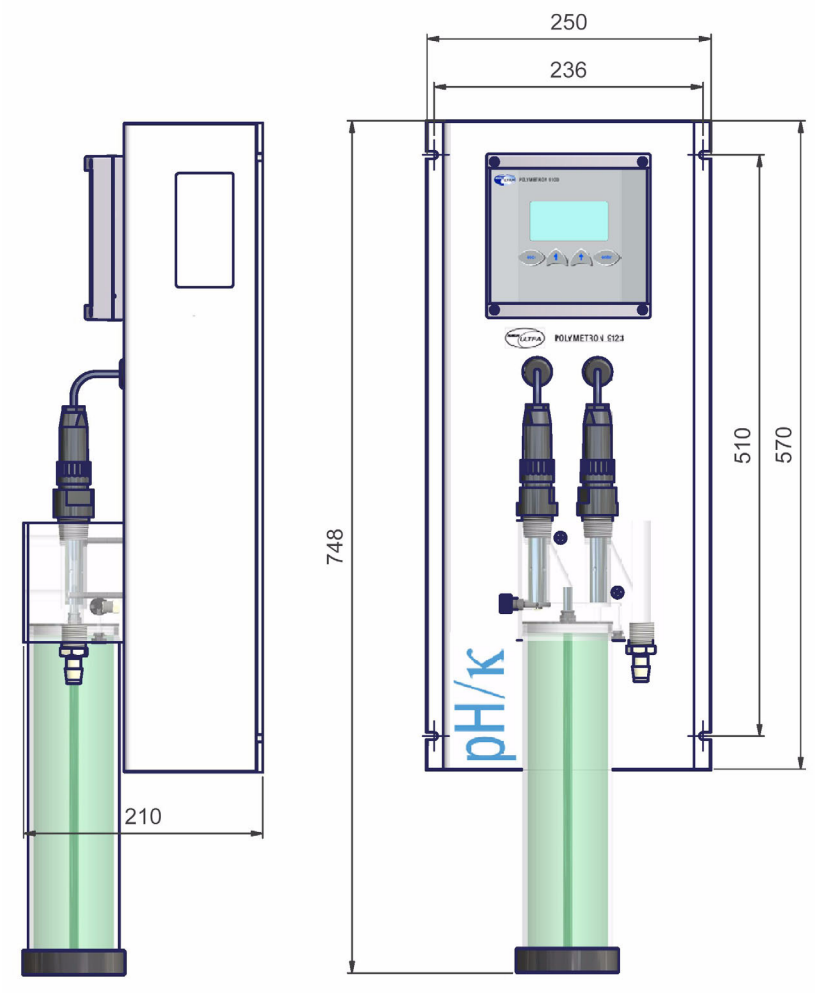


Fig 2-5: Analyzer Dimensions (mm)

2.6.2 Mounting the Analyzer

Mount the analyzer using 4 M6 screws to fix the instrument securely in place.

2.6.3 Sensor Positioning

The sensor for channel one is placed before the resin (on the left side as viewed from the front), and for channel two after the resin (on the right side as viewed from the front).

Note:
The standard length of the conductivity sensor cables is 1.0 meters.

2.6.4 Resin Cartridge Installation

Screw the tube containing the cationic resin tightly onto the measuring cell of the analyzer to ensure the system is watertight. See also “Resin Replacement” on page 50 for additional information.

2.6.5 Hydraulic Connections

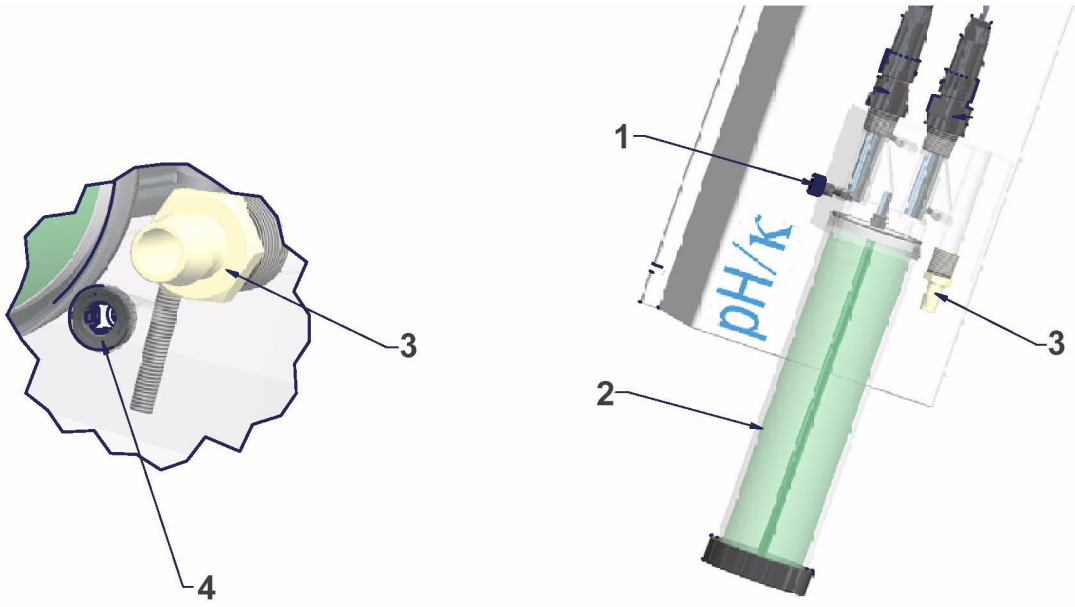


Fig 2-6: Hydraulic Connections

1. Sample flow adjustment valve
2. Cationic resin cartridge
3. Sample output (12 x 17 mm)
4. Sample input (4 x 6 mm)

Connect the sample input and output connections (see location in Fig 2-6 above) using flexible tubing according to the following specifications:

- Diameter: as specified in the table above
- Material: polyethylene or PTFE or FEP
- Pressure 0.2 to 6 bars
- Temperature: 5 to 50°C

Insert the tubing into the quick release connections found under the flow chamber block.

2.7 Electrical Connections

2.7.1 Transmitter Electronic Board Layout

WARNING

Do not switch on the instrument until completion of the installation.

An aluminium shielding plate inside the MONEC gives a detailed description of the different terminals and their connections to external elements:

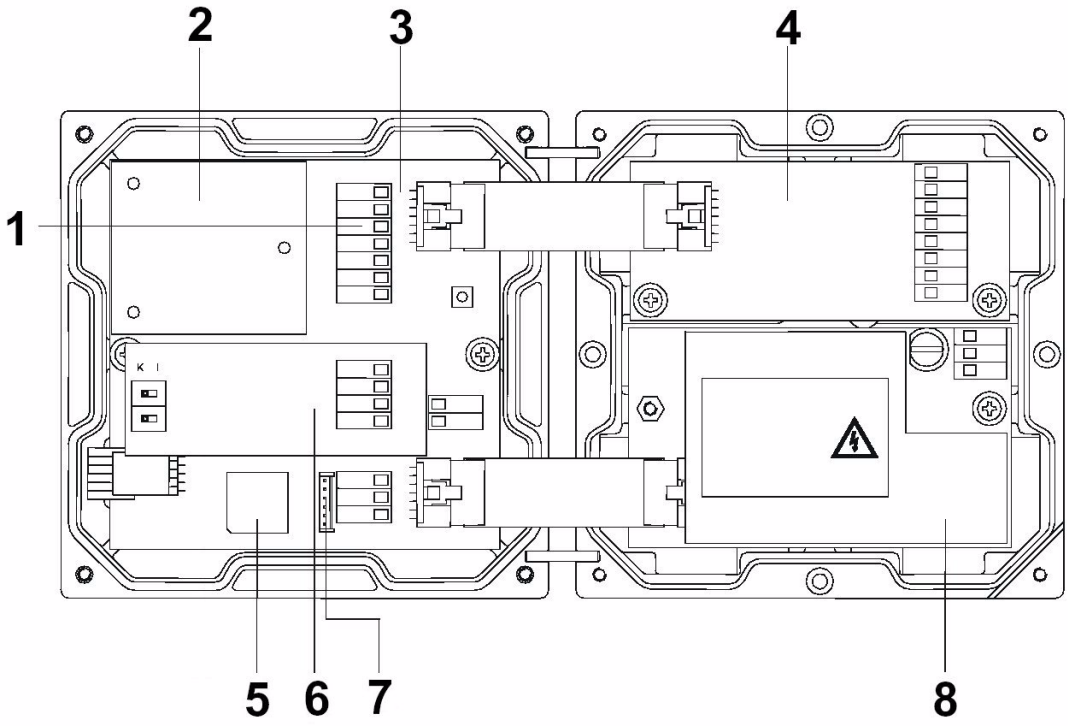


Fig 2-7: Electronic Board Layout

1. Terminal Block 4-20 mA	5. Programmed EEPROM
2. RS485 Modbus or Profibus DP Board (option)	6. Conductivity Module
3. CPU Board	7. Software Update Connector
4. Relay Board (option)	8. Power Supply Board

2.7.2 Shielding Plate

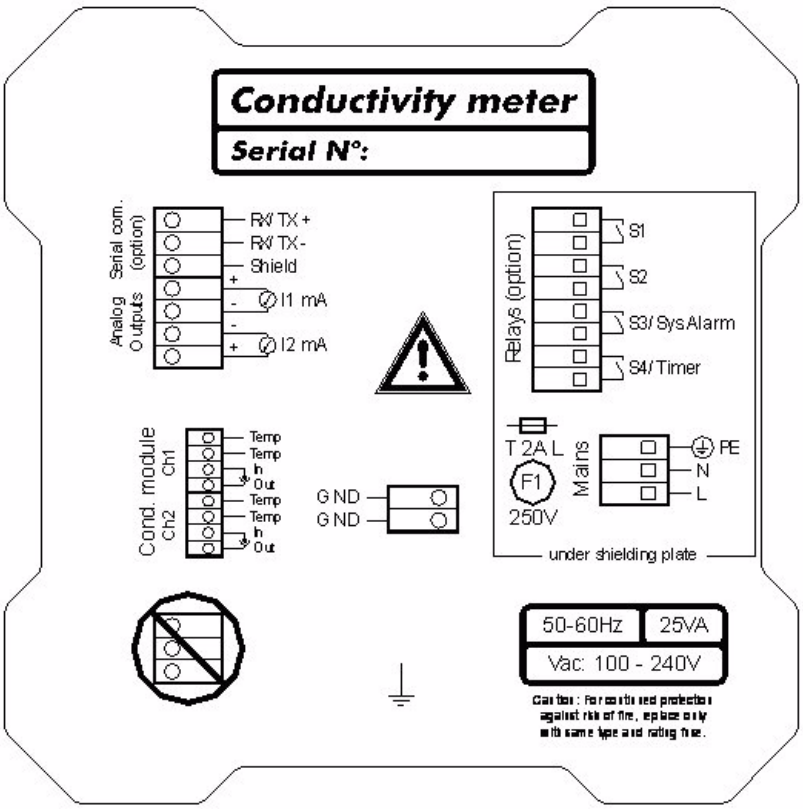


Fig 2-8: Shielding Plate

Electric connections are made on the terminal connectors inside the housing. Put the cables into the appropriate openings.

- The main supply and relay cables should be fed through the openings behind the shielded plate. To remove the plate, unscrew the fixing screw on the left side of the plate.
- When opening the transmitter be careful of any attached cables.
- Sensor and mA output cables should be fed through the openings provided on top of the plate.
- It is required to use shielded cables. The shielding should be connected to the central shielding earth.

2.7.3 Power and Relay Connections

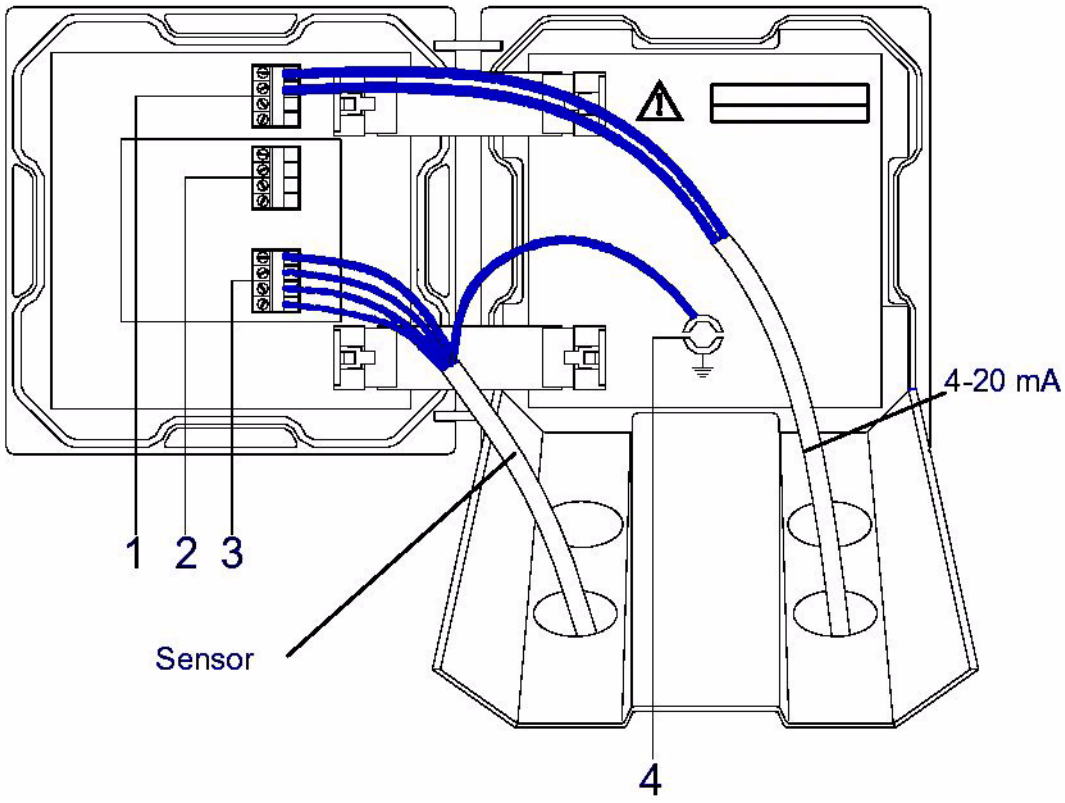


Fig 2-9: Power and Relay Connections

1. Connections 4-20 mA Analog Outputs	3. Connections of Conductivity Sensor
2. Connections Optional RS485	4. Earth

2.7.4 Mains Connection

WARNING

Mains power should always be cut off prior to working inside the instrument.

Electrical connections should be performed by qualified personnel. The power supply accepts 100-240 VAC ± 10% (50/60 Hz) without changes in configuration. The terminal block for power connections can be lifted from its header for easier installation.

For safety reasons, it is essential that the following precautions for use are respected:

- Use a three wire mains supply cable (2 core + PE) with a cross-section between 0.35 and 2 mm^2 (AWG 22 to 14) rated at 105°C minimum. The external cable insulation should be cut as close as possible from the terminal block.
- The instrument should be connected to the mains by means of a circuit breaker or fuse whose value should be inferior or equal to 20 A. It should be positioned close to the transmitter and identified.
- This protection should cut off the phase and neutral in the even of an electrical problem or if the user wishes to access the inside of the instrument. The protective earth connector, on the other hand, must always be connected.
- Cabling should be specified for a minimum of 80°C (176°F).

2.7.5 Relay Connections

The transmitter is equipped with 4 relays. Relay S4 may be configured as a temporized relay. The nominal value of the cutoff current of each relay is 2A for 250 VCA or 0,5 A for 100 VCC. Cabling should be specified for a minimum of 80°C (176°F). See Fig 2-7 on page 21 for connection location.

- S1 is located on the upper part of the terminal and S2, S3 and S4 under. Each relay is connected to a 2 separated contact terminal, which may be removed to facilitate the installation.
- The relay operation is configured in the software but the relay switches are always open when the unit is switched off.

2.7.6 Output Current Connections (mA output)

The transmitter has two analog outputs, which may be set in 0-20 or 4-20 mA and which are galvanically insulated from the controller. Maximum load for each output is 800 Ohms. See Fig 2-7 on page 21 for the terminal location.

- Use a signal cable with shielded twisted pair with the earth shielding in the transmitter.
- Connect the cable to the terminal according to the drawing on the shielded plate.

2.8 Sensor Connections

The conductivity sensors have a double shielding, the first shielding is connected to the CPU board, the second one (external) is connected to earth on the shielded plate.

Make the connections according to the following table:

CH1/CH2	Kohlrausch
TEMP+	blue
TEMP-	black
IN	red
OUT	white
GND	internal shield
	external shield

CAUTION:
Use only Hach Ultra supplied cables. Using other types of cables does not ensure the conformity to the electromagnetic compatibility standards.

2.9 Post-Installation Procedures

If your display contrast is too low, you can adjust it using the P1 potentiometer (blue). This potentiometer is located in the upper right hand corner of the CPU board, accessible after having opened the transmitter housing (see Fig 2-7 on page 21).

Once the transmitter has been physically installed, and before any measurements or calibrations are performed, you may wish to change the operating language of the transmitter. Should you wish to change the language (defaulted to English), follow the instructions in “DISPLAY Option” on page 46 and change to a language of your choice.

2.10 Analyzer Start-up

Open the sample input using the flow regulation valve and adjust the flow to the required rate of between 5 and 20 liters/hour. The sample should flow through the cationic resin. It is recommended to pass about 10 liters of sample through the new resin to thoroughly rinse it and prepare the analyzer for measurements.

You should now calibrate the analyzer as described in “CALIBRATION Menu” on page 31.

3 Operating Instructions

Note:
All screen display examples in the following sections are shown as black on a white background for clarity purposes, and therefore do not reflect the actual colors used on the instrument display.

3.1 Description of the Function Keys

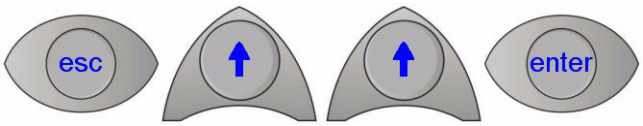


Fig 3-1: Function Keys

The user interface of the transmitter is made up of a display screen and 4 function keys:

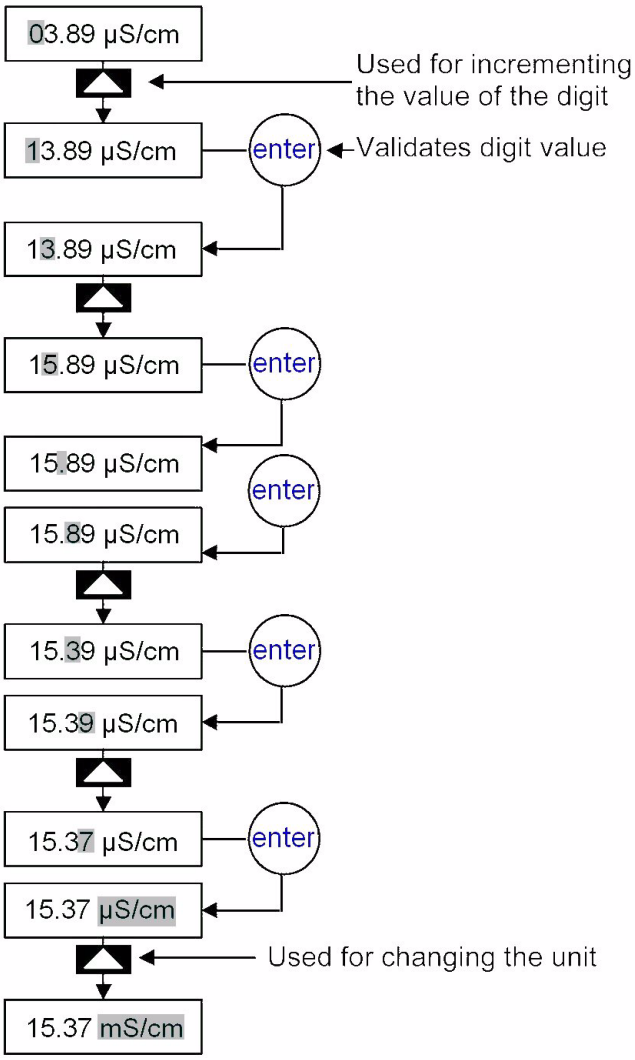
- The **esc** key cancels data input or goes back to the previous screen.
- The **enter** key validates the input and goes on to the next step.
- The function of the **Up Arrow** keys depends on the option displayed immediately above them on the screen, as listed below.

▲	Modify a parameter
Select	Choose a menu
Main	Go back to the main display
Menu	Display the main menu
Disp2	Display screen 2
Disp3	Display screen 3
OK	Validate the measure during a calibration
-	Decrease a value
+	Increase a value

3.2 Enter or Modify a Value

- The highlighted digit can be altered using the  function key
- Validate each digit using the **Enter** function key. Repeat these two operations for the other digits
- With the 1st digit, the "-" sign can be displayed
- On other digits, a "." can be displayed

Example:



Note:
If you do not touch any keys for over 2 minutes, the instrument returns to the main display. An access code for calibration and programming can be set up (see “CODE Option” on page 47) in order to protect the configuration.

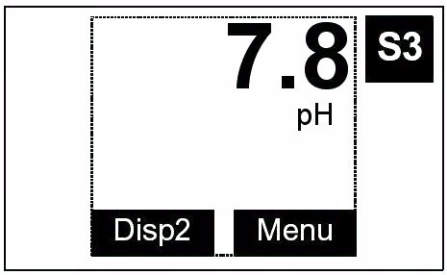
3.3 Measurement Displays

The actual display will vary according to the configuration set up (see “DISPLAY Option” on page 46). The following are examples only.

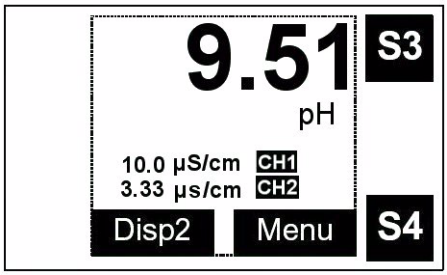
Note:
*Select the **Dispn** option at the bottom of the screen to view the next available screen in the series. These will vary according to the display setup.*

3.3.1 Basic Display

Mode = Simple



Mode = Full



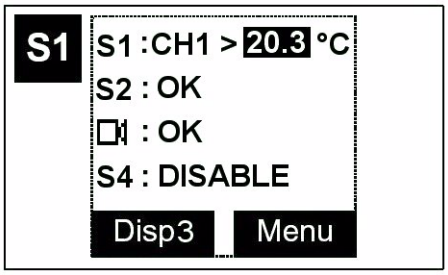
The “Simple” mode display shows the pH calculation for channel 1 only. Select **Disp2** to view measurement details for channel 1 and **Disp3** for channel 2.

The “Full” mode display shows pH calculation for channel 1 only, and the conductivity measurements for both channels.

In either mode, to view additional measurements (conductivity and temperature), select **Disp2** and **Disp3** when displayed.

Note:
*If Alarm 4 has been set to **Timer** mode (see “ALARM 4 - (timer)” on page 41), then instead of the **Disp2** and **Menu** options being displayed at the bottom of the screen, the time before the next cleaning cycle will be displayed. This time counts down from the defined interval to zero before triggering **Alarm 4**. Alarm 4 will then be activated for the duration set (**Ton** parameter), before restarting a new countdown based on the **Interv** parameter.*

3.3.2 Alarm Status



The alarm status screen lists the current status of the four alarms. The example illustrated left shows:

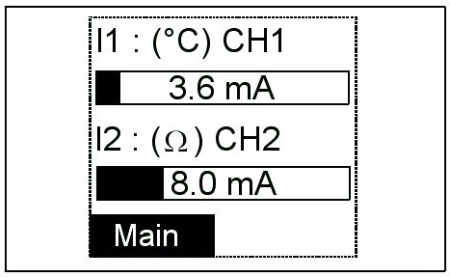
S1: Alarm 1 has been activated by a temperature on channel 1 of greater than 20.3 degrees centigrade

S2: OK indicates alarm 2 is not activated

S3: When the symbol illustrated is displayed, it indicates that alarm 3 has been set up as a system alarm. OK indicates the system alarm is not activated.

S4: Disable indicates alarm 4 has not been set up and is therefore inactive.

3.3.3 Analog Output



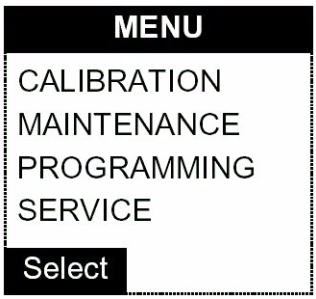
This is the last screen in the series and displays a bar graph for each channel showing the analog output for the respective channel in mA.

The line above the bar graph indicates the the measurement and channel as set up in “mA OUTPUTS Option” on page 42.

4 Programming the Transmitter

4.1 MAIN Menu

Note:
*All the menus are "rolling menus" and will normally display only three menu options. Pressing the **Select** option will scroll down the menu to display additional options. The illustrations in this section show the complete list of menu options available.*



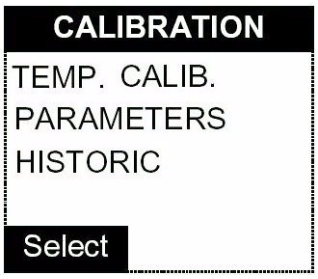
The main menu gives access to 4 main functions of the transmitter:

- CALIBRATION
- MAINTENANCE
- PROGRAMMING
- SERVICE

4.2 CALIBRATION Menu

Note:
Before starting any calibration, check the parameters of the MEASURE menu (probe type, temperature compensation, etc.) are correctly configured (see "MEASURE Option" on page 38).

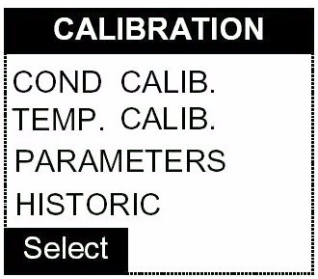
Select **CALIBRATION** from the main menu to access the calibration menu. This menu differs slightly if the **complete analyzer** (09123=A=1000) was purchased rather than the **transmitter only** (09123=A=0000).



The menu illustrated left will appear if you have purchased the **complete analyzer** and allows calibration of the temperature measurement.

Options to view the calibration parameters and the details of the last two calibrations (HISTORIC option) are also available.

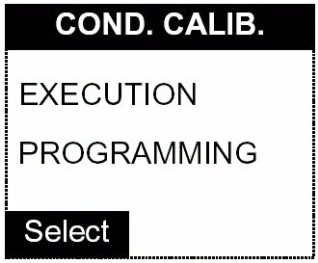
For more information continue with "Temperature Calibration" on page 36, as the following section applies to the purchase of the transmitter only.



The menu illustrated left will appear if you have purchased the **transmitter only** and allows calibration of the conductivity and temperature measurements.

Options to view the calibration parameters and the details of the last two calibrations (HISTORIC option) are also available.

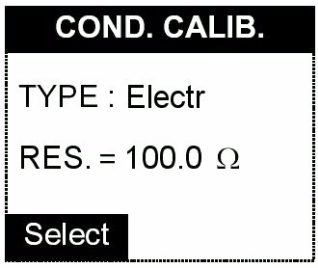
4.2.1 Conductivity Calibration



Select the **COND. CALIB.** option. Two options appear:

- **EXECUTION** - perform a calibration according to the instrument configuration
- **PROGRAMMING** - gives the option to choose the type of calibration:
  - Electric
  - 2 points
  - 1 point

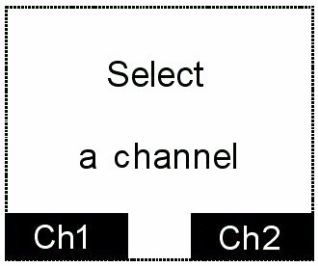
Electric Calibration



This mode calibrates the instrument from a reference resistance. Choose **COND. CALIB.** and select **PROGRAMMING**.

Ensure the type of calibration is set to **Electr** and enter the resistance value for the calibration (in Ω, kΩ, or MΩ).

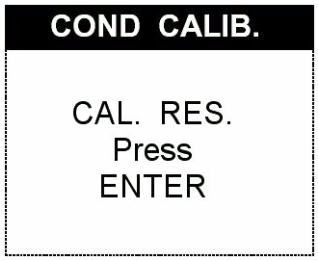
Select **Esc** to go back to the previous menu and select **EXECUTION**. Then press **Enter**.



Select the channel to calibrate by pressing on either **Ch1** or **Ch2**.

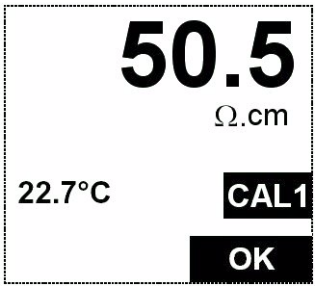
A screen is then displayed asking for the sensor to be removed from the sample. Once removed, press on **Enter**.

The egg-timer symbol will be displayed, and after a few seconds the zero calibration will have been calculated automatically.



When the new screen (illustrated left) is displayed, replace the sensor with a resistance whose value is the same as that entered in the first screen above.

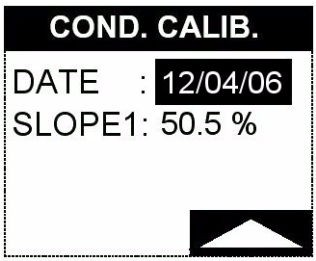
Press **Enter** to continue when ready.



The measurements will be displayed and **CAL1** or **CAL2** will flash, depending on the channel selected.

Once the measurement is stable, press **OK**.

Note:
A calibration is not possible if the slope shift is outside the range limits of 50-150%.

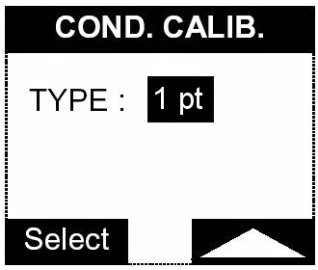


Change the calibration date by updating the date displayed and press on **Enter**.

Note that pressing on **Esc** will invalidate the parameters and the previous ones will be used.

The sensor can now be replaced back in the sample.

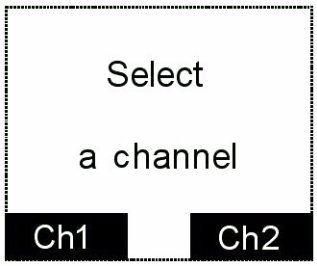
One Point Calibration



This mode calibrates the instrument using a solution of known conductivity. This calibration only corrects the slope of the instrument.

Choose **COND. CALIB.** and select **PROGRAMMING**.

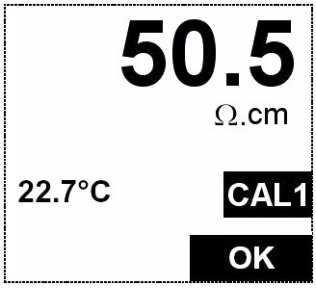
Ensure the type of calibration is set to **1 pt** and select **Esc** to go back to the previous menu and then select **EXECUTION**. Press **Enter**.



Select the channel to calibrate by pressing on either **Ch1** or **Ch2**.

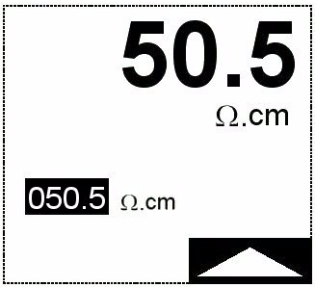
Place the sensor in the calibration solution.

Press **Enter** to continue when ready.



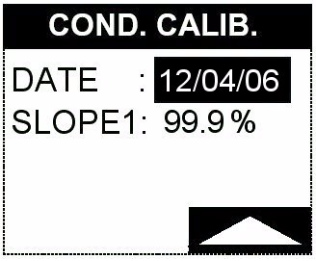
The measurements are displayed and **CAL1** or **CAL2** will flash, depending on the channel selected.

When the measurement is stable press on **OK**.



You now have the option to change the measured value if this differs from the expected value for the calibration solution.

Note:
A calibration is not possible if the slope shift is outside the range limits of 50-150%.

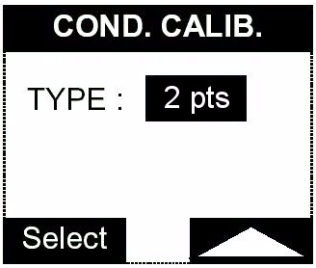


Modify the calibration date by updating the date displayed. To validate the calibration parameters press on **Enter**.

Note that pressing on **Esc** will invalidate the parameters and the previous ones will be used.

The sensor can now be replaced back in the sample.

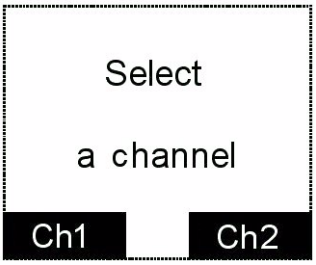
Two Point Calibration



This mode calibrates the instrument using a solution of known conductivity. This calibration corrects the offset and slope of the instrument.

Choose **COND. CALIB.** and select **PROGRAMMING**.

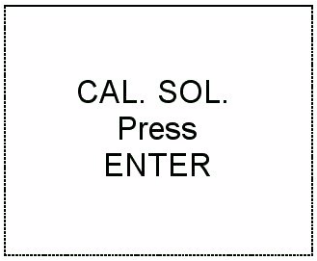
Ensure the type of calibration is set to **2 pts** and select **Esc** to go back to the previous menu and then select **EXECUTION**. Press **Enter**.



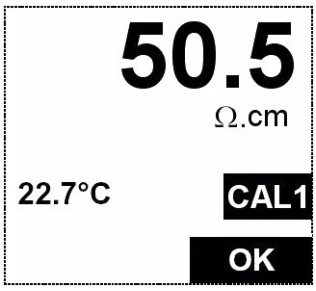
Select the channel to calibrate by pressing on either **Ch1** or **Ch2**.

A screen is then displayed asking for the sensor to be removed from the sample. Once done, press on **Enter**.

The egg-timer symbol will be displayed, and after about a few seconds the zero calibration will have been calculated automatically and a new screen displayed.

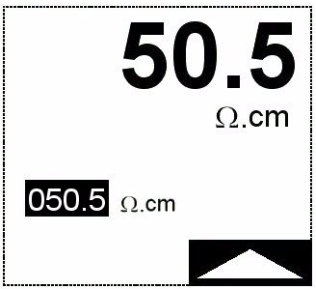


Place the sensor in the calibration solution and press **Enter**.



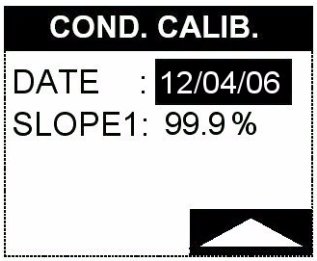
The measurements are displayed and **CAL1** or **CAL2** with flash depending on the channel selected.

When the measurement is stable press on **OK**.



You now have the option to change the measured value if this differs from the expected value for the calibration solution.

Note:
A calibration is not possible if the slope shift is outside the range limits of 50-150%.

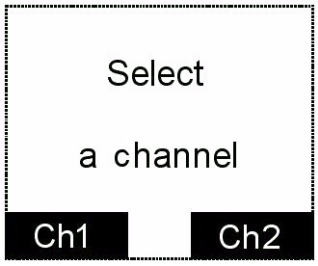


Modify the calibration date by updating the date displayed. To validate the calibration parameters press on **Enter**.

Note that pressing on **Esc** will invalidate the parameters and the previous ones will be used.

The sensor can now be replaced back in the sample.

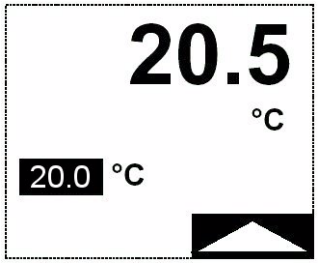
4.2.2 Temperature Calibration



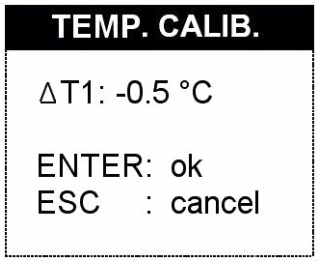
Choose **TEMP. CALIB.** and select **EXECUTION** to start the process.

Then Select the channel to calibrate by pressing on either **Ch1** or **Ch2**.

Wait until the temperature measurement has stabilized and press on **OK**.



Correct the temperature value if necessary.

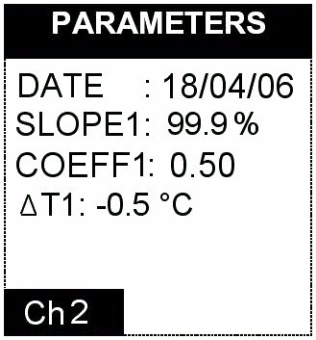


A screen will be displayed showing the difference between the measured temperature value and the value of the temperature correction (if any) entered on the previous screen.

A calibration is not possible if this value is outside the accepted limits of ±10°C.

Select **ENTER** to accept the calibration or **ESC** to reject.

4.2.3 Parameters Menu



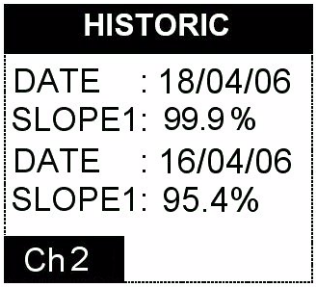
This option displays the calibration parameters of the conductivity measurement.

The calibration parameters for channel 1 are displayed first.

- The date is the date of the calibration (as entered by the user).
- The slope correction factor of the sensor
- Temperature measurement drift

Press **Ch2** to view the parameters for channel 2 or **Esc** to exit.

4.2.4 Historic Menu

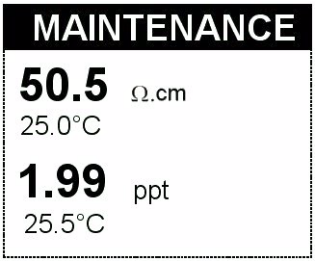


This menu displays the conductivity slopes corresponding to the last two conductivity calibrations.

By default, details for channel 1 are displayed first.

Press **Ch2** to view the parameters for channel 2.

4.3 MAINTENANCE Menu

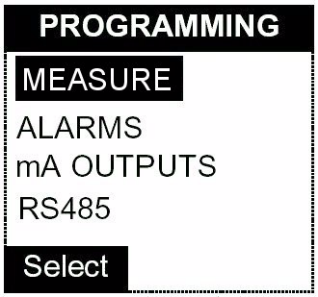


When changing or cleaning a sensor or servicing the instrument, select the **MAINTENANCE** option.

The instrument will continue to display measurements, but the analog output value will be the value programmed in the mA Menu (see “SPECIAL PROG” on page 43).

The relay status is not affected.

4.4 PROGRAMMING Menu



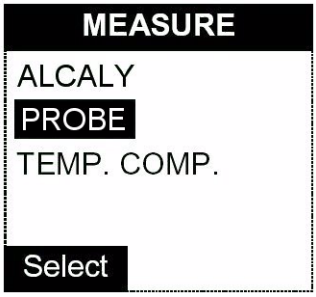
This menu enables the configuration of the 9123 instrument according to the application.

When accessing this menu, any measurements, analog outputs and alarms remain active.

RS485 is illustrated (left) as a menu option, but the actual option displayed will depend on the communications board installed (RS485 or PROFIBUS).

Note:
It may be necessary to enter a password to access this screen if one has been programmed.

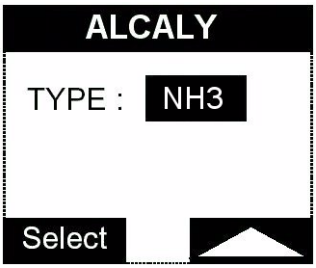
4.4.1 MEASURE Option



The **PROBE** option is used to configure the type of probe(s) being used. The model 8310 probe is recommended.

TEMP. COMP. is used to define the temperature compensation.

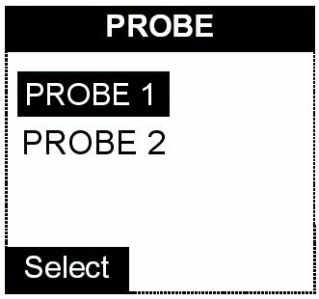
4.4.1.1 ALCALY



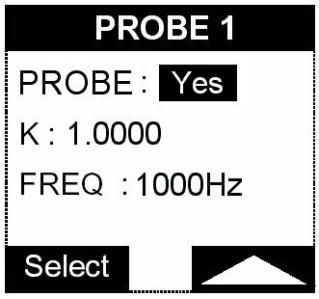
ALCALY determines the chemical conditions under which the pH is calculated.

In other words if the sample contains ammonia (NH3), sodium hydroxide (NaOH) or ethanolamine (C2H7NO).

4.4.1.2 PROBE



Select the probe to configure, from either channel 1 (**PROBE 1**) or channel 2 (**PROBE 2**).



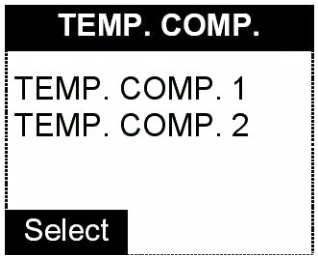
PROBE must be set to **Yes** to activate the conductivity measurement for the selected channel.

The value **K** is factory set.

In order to optimize the measurement precision when using long cables (and for the single transmitter), it is possible to adapt the frequency (**FREQ**) of the instrument as follows:

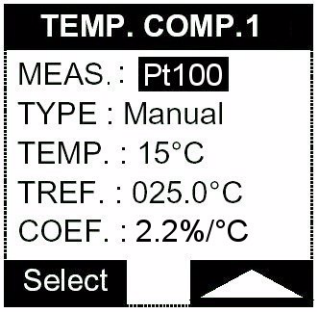
- 100 - for long cables (100m)
- 500 - for medium length cables (50m)
- 1000 - for short cables (10m) - as used with the model 9123=A=1000 analyzer

4.4.1.3 TEMP. COMP.



Select between channel 1 (**TEMP. COMP. 1**) and channel 2 (**TEMP. COMP. 2**).

TEMP COMP 1



MEAS: Select **Pt100** (default) if the temperature is being measured with a Pt100, otherwise select **No**.

TYPE: Choose between **No** temperature compensation, an **Automatic** (only available if Pt100 was selected above) or **Manual** temperature compensation mode.

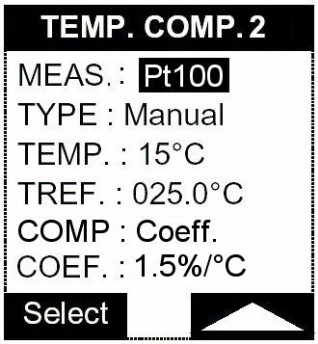
Note:
If No was selected for both MEAS and TYPE, then the following parameters are not available.

TEMP: Enter the sample temperature for a manual temperature compensation. This is not available if automatic compensation was selected.

TREF: Enter a reference temperature.

COEF.: Enter the temperature compensation coefficient - 2.2%/°C is the recommended value.

TEMP COMP 2

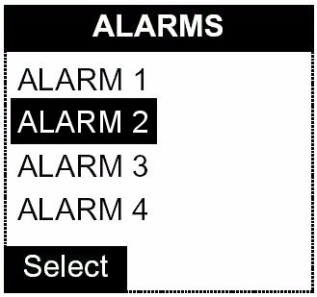


With temperature compensation for channel 2, the first four fields are the same as for channel 1.

COMP: Enter the type of temperature compensation between a coefficient or HCl. If a coefficient is selected then enter the temperature compensation coefficient. If HCl is selected, no further input is required.

COEF.: Enter the temperature compensation coefficient - 1.5%/°C is the recommended value.

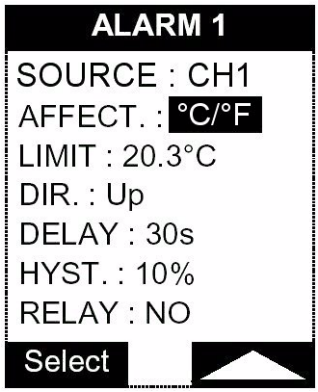
4.4.2 ALARMS Option



This menu is used to configure each of the four alarms.

Select the alarm to configure.

4.4.2.1 ALARMS 1/2 - (Mode = Limit)



SOURCE: The measurement channel triggering the alarm is either CH1 or CH2.

AFFECT: Choose if the limit is allocated to a measurement (S/Ω), temperature (°C/°F) or CALC.

LIMIT: Enter the value that will trigger the alarm.

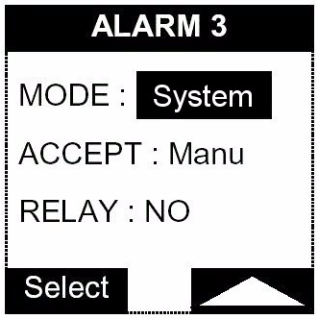
DIR: Enter the direction (Up or Down).

DELAY: Time delay (in seconds) before the alarm, after reaching the defined limit, is triggered.

HYST: Defines the hysteresis percentage.

RELAY: Choose if the relay is normally opened (NO) or normally closed (NC).

4.4.2.2 ALARM 3 - (system alarm)



For alarm 3, there is a choice between a limit or system alarm. Set the **MODE** to **No** (for no alarm), **Limit** (limit alarm) or **System** (system alarm).

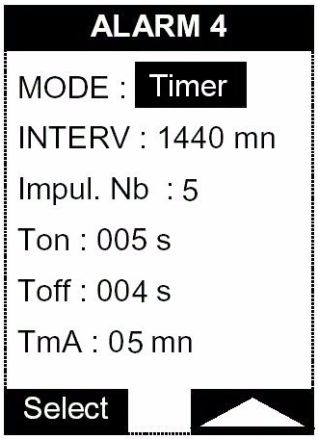
If set to Limit, the process is the same as for Alarms 1/2 above.

For a system alarm:

ACCEPT: Set to Manu (for a manual acceptance of the alarm) or Auto (for automatic acceptance).

RELAY: Choose between NO (normally open) and NC (normally closed).

4.4.2.3 ALARM 4 - (timer)



For alarm 4, there is a choice between a limit or timer function. Set the **MODE** to **No** (for no alarm), **Limit** (limit alarm) or **Timer** (timer function).

For the timer function:

INTERV: The interval (in minutes) between two cycles.

Impul. Nb: Number of pulses of each cycle.

Ton: Adjustment of the relay active time (in seconds) for each pulse.

Toff: Adjustment of the relay inactive time (in seconds) for each pulse.

TmA: Hold time (in minutes) for the analog outputs after each cycle.

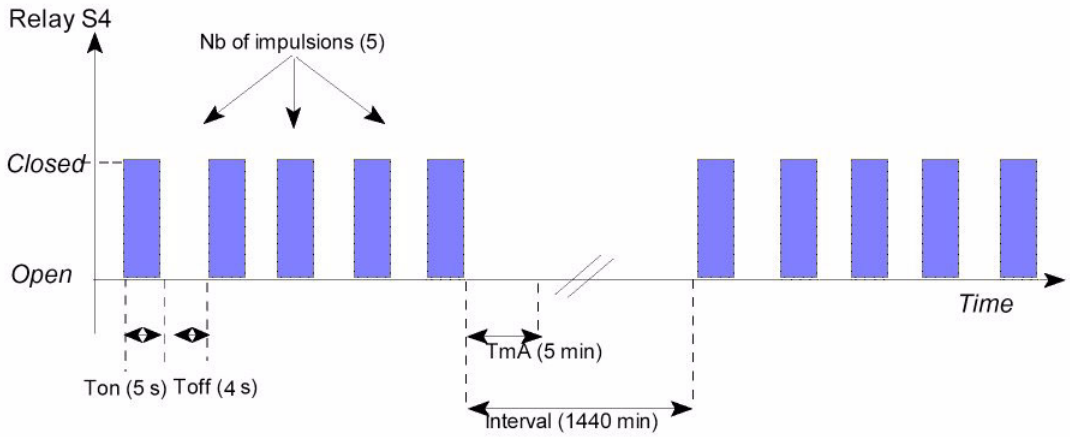
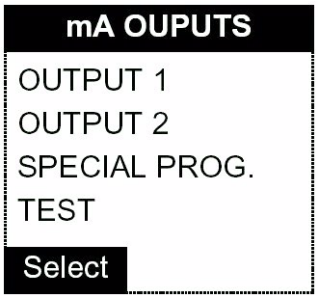
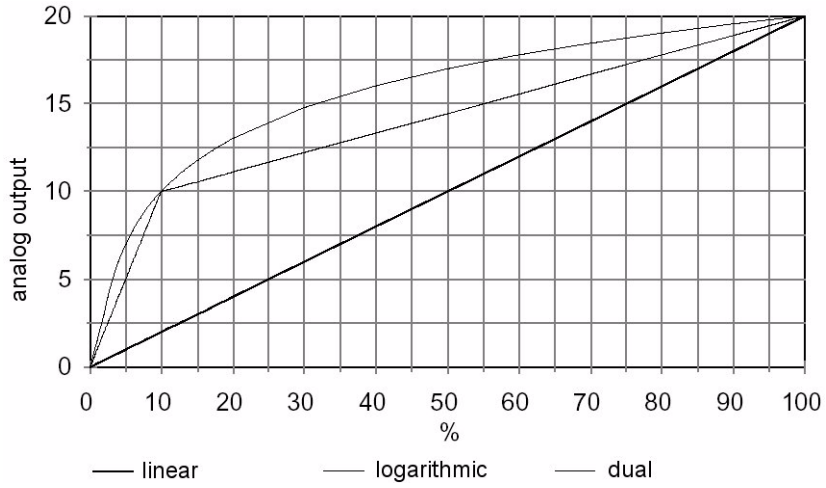


Fig 4-1: Example of Timer Function Using Above Parameters

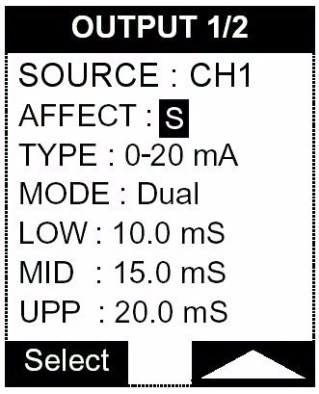
4.4.3 mA OUTPUTS Option



This menu is used to configure the analog outputs, a graphical representation of which is shown below.



4.4.3.1 OUTPUTS 1/2



SOURCE: For each of the two outputs (output 1 or output 2) the source of the analog output is either the measurement channel (**CH1** or **CH2**) or the calculated pH (**CALC**).

AFFECT: Choose if the output is allocated to a measurement (S/Ω) or temperature (°C/°F). The options available will depend on previous parameters selected for this channel. This option is not displayed if the calculated pH is sent to the analog output (**SOURCE** set to **CALC**).

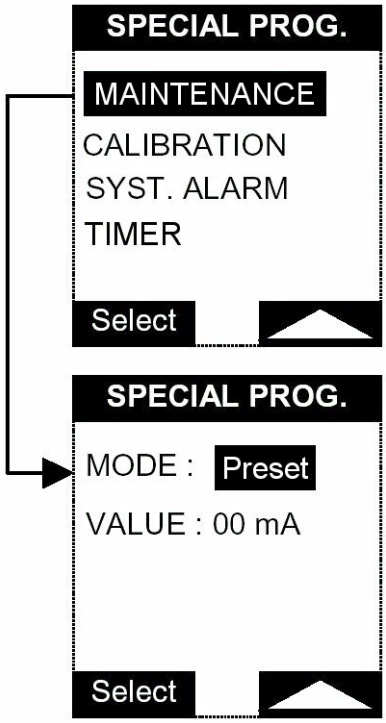
TYPE: The analog output type (0-20 or 4-20 mA).

MODE: This is the operating mode and is either linear, logarithmic or dual. If logarithmic mode is selected, the start of the range should not be zero.

LOW, **MID** and **UPP**: These define the lower, middle and upper measurement range limits. MID can only used if the mode is set to dual.

Note:
For analog output 2 only, it is possible to define 2 upper limits (UP1 and UP2). When the measured value is higher than UP1, the 4-20 mA signal passes to the second limit (UP2). For normal linear operation, ensure the values of UP1 and UP2 are identical.

4.4.3.2 SPECIAL PROG

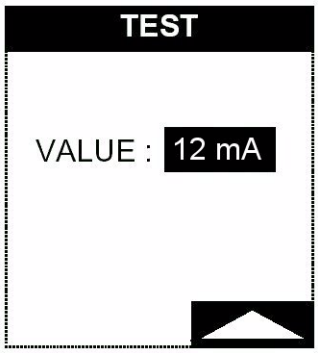


This menu is used to set the analog output values for specific events (**MAINTENANCE**, **CALIBRATION**, **SYSTEM ALARM**, and **TIMER**).

The **MODE** gives the choice of the type of value (last, preset, or live).

If preset is selected, enter the **VALUE** required.

4.4.3.3 TEST



The **TEST** option tests the analog outputs in steps of 1 m A from a value of 0 up to 21.

4.4.4 RS485 Option

This option requires the instrument be fitted with an optional RS485 communications board and is used to configure the RS485 options. The communications protocol is MODBUS/JBUS. See also the 9100 MODBUS manual.

N°: Define the address of the MONEC on the MODBUS bus (**1 - 247**).

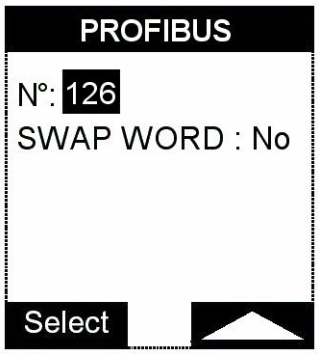
BAUD: Choose the baud rate between **300**, **600**, **1200**, **2400**, **4800**, **9600**, and **19200**.

PARITY: Choose the parity between **No**, **Odd** and **Even**.

STOP BIT: Either **1** or **2**.

SWAP WORD: Set the swap word to either **Yes** or **No**. Some equipment requires this be set to yes, to invert the format of the data for a correct interpretation.

4.4.5 PROFIBUS Option

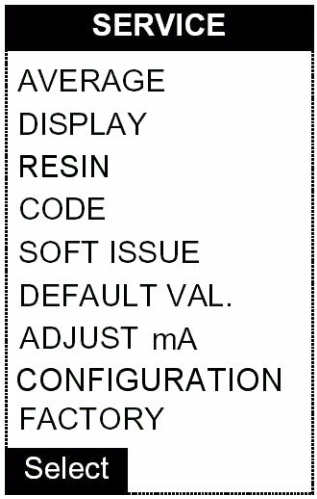


This option requires the instrument be fitted with an optional PROFIBUS communications board and is used to configure the PROFIBUS options. The PROFIBUS communications protocol is DPV0. See also the 9100 PROFIBUS manual.

N°: Define the address of the MONEC on the PROFIBUS bus (**1 - 126**).

SWAP WORD: Set the swap word to either **Yes** or **No**. Some equipment requires this be set to yes, to invert the format of the data for a correct interpretation.

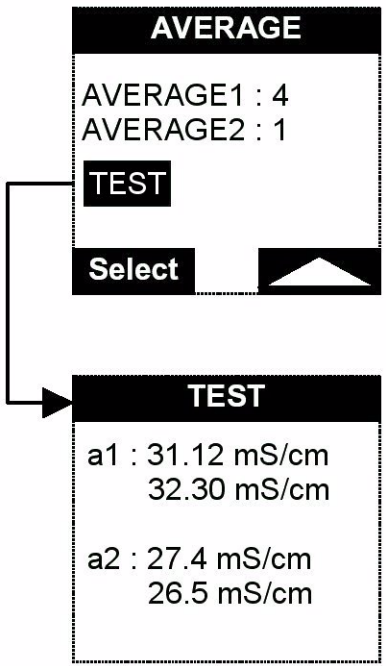
4.5 SERVICE Menu



The main screen gives access to the different configuration options of the 9123.

Note:
It may be necessary to enter a password to access this screen if one has been programmed.

4.5.1 AVERAGE Option



The AVERAGE option allows you to program the number of measurements from which to take an average value.

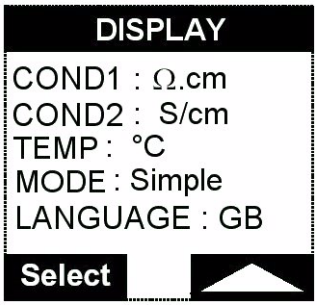
Use the up arrow key to increase the value (from 1 to 10), and press **Enter** to accept the new value.

In the example left, AVERAGE 1 is set to a value of 4 which means the displayed measurement for channel 1 will be the average of 4 measurements.

Selecting the TEST option will then display the difference between a measurement with and without the average (a1 or a2) being applied.

Press **Esc** to exit.

4.5.2 DISPLAY Option



The DISPLAY option is used to set a number of options for the screen displays.

These are detailed below.

COND1 and **COND2** define the measurement units for the conductivity/resistivity value of each channel:

- S/cm
- Ω.cm
- S/m
- Ω.m

Note:
*in order to make a valid pH calculation, the measurement unit for **COND1** and **COND2** must be the same.*

TEMP defines if the temperature measurement is displayed in °C or °F.

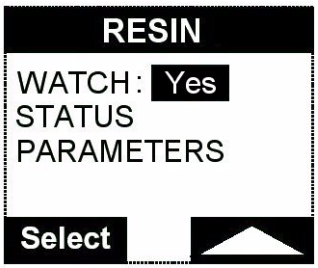
The **MODE** can be set to either Simple or Full and defines the type of display in the main measurement screens.

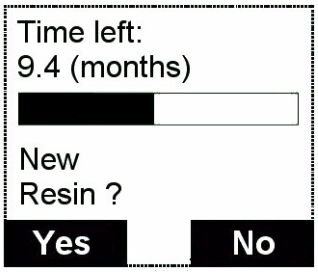
In simple mode, only the main measurement value is displayed. In full mode, the main measurement and associated values for each channel are displayed (see display examples in “Measurement Displays” on page 29).

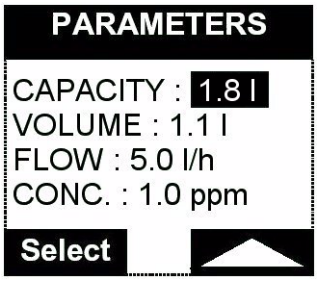
LANGUAGE defines the display language and can be set to either:

- French (F)
- English (GB - default)
- German (D)
- Spanish (Sp)
- Italian (I)
- Dutch (NL)

4.5.3 RESIN Option







WATCH: This option lets you select if you want to monitor the resin (**Yes** or **No**).

If set to **Yes**, then when the life expectancy of the resin is less than 10 days, the message **Resin Defect !** is displayed on the instrument.

After 10 days if the resin has still not been changed, the instrument triggers a system alarm and the S3 relay is activated.

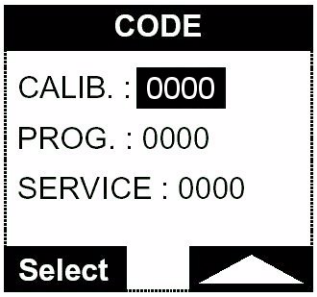
STATUS: This option displays the current life expectancy of the resin in a numeric and visual format, and allows a re-initialization of the timer after a change of resin.

When the resin is changed, go to this screen and select **Yes** to the question. The remaining time will then be recalculated based on the parameters entered in the parameters screen.

PARAMETERS: This option is used to set the parameters that determine the life expectancy of the resin as displayed in the status screen:

- **CAPACITY**: between 0.5 and 5.0 mole/liter. This relates to the resin exchange capacity and has a default value of 1.8 mole/liter
- **VOLUME**: between 0.5 and 20.0 liters. The resin volume is set at 1.1 liters by default.
- **FLOW**: between 2.0 and 20.0 liters/hour
- **CONC.**: between 0.0 and 20 ppm

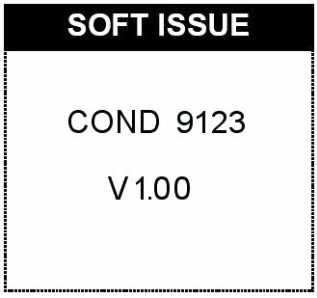
4.5.4 CODE Option



Set the access codes for the **CALIBRATION**, **PROGRAMMING** and **SERVICE** menus.

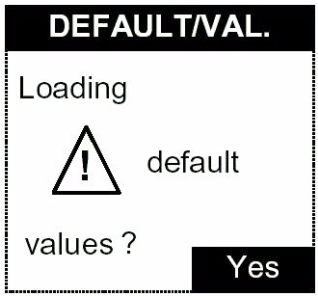
A value of 0000 indicates no password is required.

4.5.5 SOFT ISSUE Option



This option displays the type of instrument and the version of the installed software.

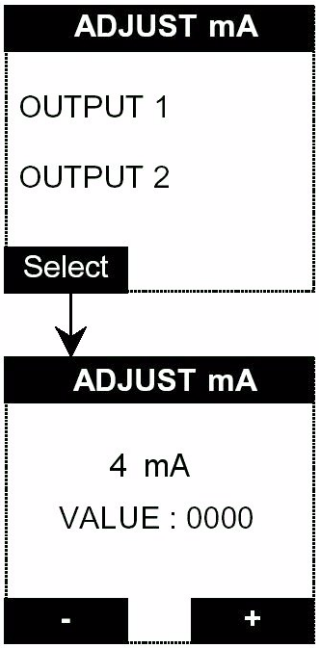
4.5.6 DEFAULT VALUES Option



Selecting **Yes** reloads all the default values and all the previously programmed values and calibration parameters are lost.

Press **Esc** to exit the menu without loading the default values.

4.5.7 ADJUST mA Option



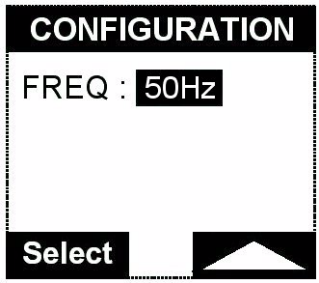
This option allows for the adjustment of the 4 and 20mA analog outputs, by an internal coefficient of between -999 and +9999.

Choose either **OUTPUT1** or **OUTPUT2** as required.

The first screen displayed will allow adjustment of the 4mA output. When a value has been accepted for this, the screen displays the value for the 20mA output. Use the minus and plus function keys to adjust the displayed value.

After the 20mA value has been accepted, the option to select OUTPUT1 or OUTPUT2 is re-displayed. Press **Esc** on completion.

4.5.8 CONFIGURATION Option



This option allows for adjustment of the power supply voltage frequency.

Choose between 50 and 60 Hz.

4.5.9 FACTORY Option

This option is only reserved for qualified Hach Ultra service technicians only.

5 Maintenance

Periodic maintenance will ensure accurate and consistent analysis results. Verify the levels of the calibration solution and reagents and refill where necessary.

5.1 Service Schedule

The following table shows the suggested service schedule for the 9123 Dual Channel Transmitter.

Table 5-1: Service Schedule

	Daily	Weekly	Monthly	Every 3 Months	Every 6 Months	Yearly	As Needed
Validation (check with referenced measure)				X	X	X	X
Calibration (measure)						X	X
Calibration (temperature)						X	
The following items are performed by the Hach Ultra service group							
Re-qualification (Inputs/Outputs)						X	
External audit						X	

5.2 Fuse Replacement

The fuse, which is located under the shielding plate, next to the mains connectors.

Two replacement fuses are supplied with the instrument and these must be used to replace faulty or blown fuses.

If for any reason these replacements are no longer available, only the following alternatives should be used:

- JDYX2, LITEFUSE, type 213, rated 2 AT, 250 VAC
- JDYX2, SIBA, Type 179120, rated 2 AT, 250 VAC
- JDYX2, SCHURTER, Type FST, rated 2 AT, 250 VAC

If there is any difficulty in obtaining these replacement fuses, please contact your local Hach Ultra representative for advice and assistance.

5.3 Resin Replacement

Note:
In order to take advantage of the full system specifications, we recommend the use of nuclear grade cationic resin.

For this operation, you can either replace the existing cartridge of resin with a new one following the instructions in “Cartridge Replacement Process (part number 09123=A=7000)” below, or keep the cartridge and refill using the resin replacement kit and following the instructions in “Resin Replacement Kit (part number 09123=A=7010)” on page 51.

CAUTION:
Please refer to Table C-1, “MSDS - Cationic Resin,” on page 65 *for safety and disposal information on both the used resin and used cartridges.*

5.3.1 Cartridge Replacement Process (part number 09123=A=7000)

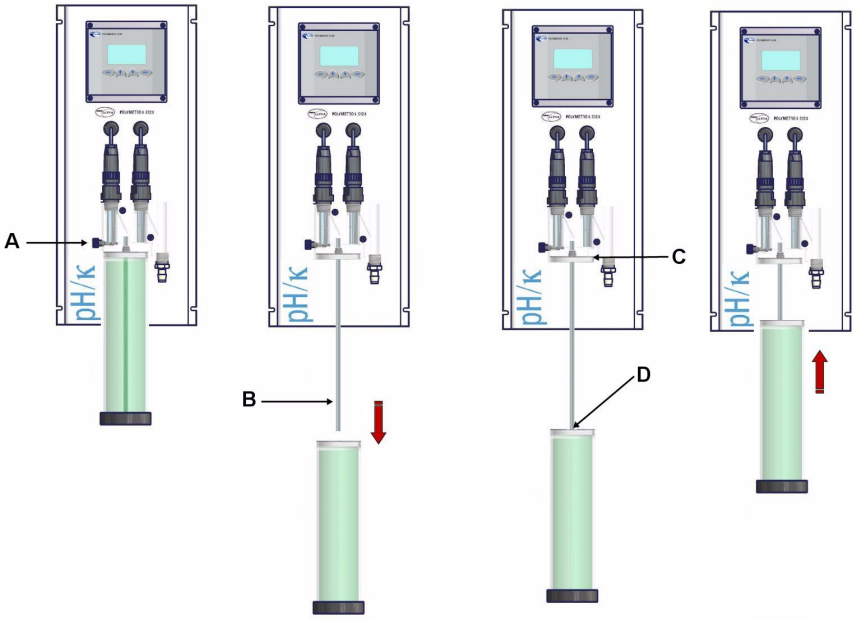


Fig 5-1: Cartridge Replacement Process

1) Stop the sample flow using the sample flow adjustment valve (**A**).
2) Unscrew the used cartridge from the measuring cell and remove carefully by pulling down on the cartridge until it clears the stainless steel tube (**B**). This tube must remain in place.
3) Unscrew the top off the new cartridge.
4) Ensure the flat viton gasket (**C**) is in place in the measuring cell.
5) Take the new cartridge and place the end of the stainless steel tube into the filter hole in the center of the new cartridge (**D**).
6) Slowly raise the new cartridge to the measuring cell and screw into place.
7) Open the sample flow adjustment valve and ensure everything is watertight and there are no leaks.
8) Set the sample flow to the required rate (between 5 and 20 L/h).
9) Activate and modify the new resin expiry parameters (see “RESIN Option” on page 47).

5.3.2 Resin Replacement Kit (part number 09123=A=7010)

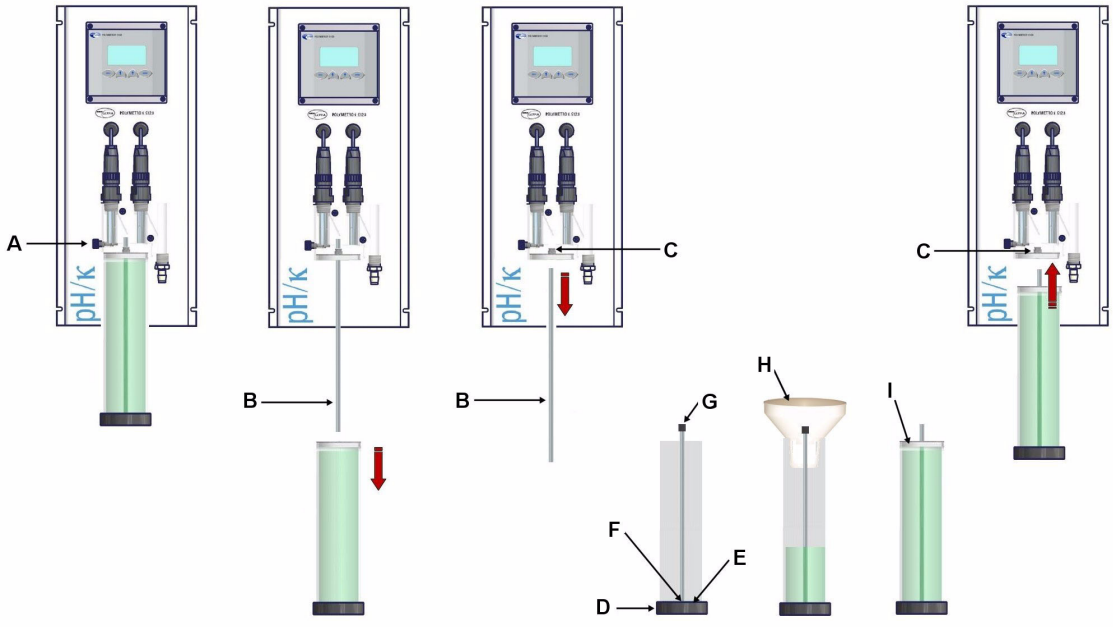


Fig 5-2: Resin Replacement Process

1) Stop the sample flow using the sample flow adjustment valve (**A**).
2) Unscrew the used cartridge from the measuring cell and remove carefully by pulling down on the cartridge until it clears the stainless steel tube (**B**).
3) Remove the stainless steel tube (**B**) by pinching the outside of the quick connector (**C**) to release it.
4) Discard the filter at the top of the cartridge, then discard the used resin and the filter at the bottom of the cartridge.
5) Make sure the stopper (**D**) is in place at the bottom of the cartridge and place one of the two filters in the bottom (**E**).
6) Place the end of the stainless steel tube in the hole in the middle of the filter (**F**).
7) It is recommended to cover the hole at the top of the stainless steel tube with a small piece of adhesive tape (**G**) to stop any resin getting into the tube.
8) Place the funnel (**H**) in the top of the cartridge.
9) Fill the cartridge with the resin adding demineralized water at regular intervals (about 300cc in total) to compact it, but leaving enough room at the top for the second filter.
10) Remove the funnel and the adhesive tape applied in step 7.
11) Place the second filter over the stainless steel tube (**I**) in the middle of the cartridge.
12) Push the stainless steel tube back into the quick connector receptacle (**C**) and screw the whole cartridge back into the measuring cell.
13) Slowly open the sample flow adjustment valve and ensure everything is watertight.
14) Set the sample flow to the required rate (between 5 and 20 L/h).
15) Activate and modify the new resin expiry parameters (see “RESIN Option” on page 47).

6 Specifications

6.1 Technical Specifications

Table 6-1: Technical Specifications

OPERATING CONDITIONS	
Ambient temperature	-20 to 60°C (4 to 140°F)
Relative humidity	10 to 90%
Power supply voltage fluctuation	± 10%
Over voltage category	2 (in accordance with standard EN 61010-1)
Pollution degree	2 (in accordance with standard CEI 664)
Altitude	< 2000 m
Measurement category	Class 1 (over voltage < 1500V)
ELECTRICAL CHARACTERISTICS	
Mains power supply	Standard version (± 10%): • 100 - 240 VAC, 50-60 Hz Low voltage version: • 13 - 30 VAC 50/60 Hz • 18 - 42 VDC 50/60 Hz
Fuse	5x20 cartridge T2AL-250V following CEI127
Consumption	25 VA.
STANDARDS	
European standards	EN 61326 (1997) and EN61326 A1 (1998) industrial level for immunity EN 61010-1 (2001) for low voltage safety
UL & CSA agreement	File E226594
MECHANICAL CHARACTERISTICS (TRANSMITTER)	
Dimension (mm)	144 x 144 x 150
Weight	2 Kg
Material	Housing: Polyester coated aluminum
Waterproofing	IP65
Mounting types	Wall, pipe or panel
Cable glands	2 x PG13.5 2 x PG11

Table 6-1: Technical Specifications

MECHANICAL CHARACTERISTICS (ANALYZER)		
Dimension (mm)	830 x 250 x 180	
Weight	7 Kg	
Material	Polyester	
Waterproofing	IP65	
Mounting type	Wall	
Cable glands	2 x PG13.5 2 x PG11	
PERFORMANCE		
2 electrode probe	Cell constant	Conductivity range
	0.01 cm^{-1} 0.1 cm^{-1} 1 cm^{-1}	0.01 µS/cm - 200 µS/cm 0.10 µS/cm - 2 mS/cm 1 µS/cm - 20 mS/cm
2 electrode probe	Cell constant	Resistivity range
	0.01 cm^{-1} 0.1 cm^{-1} 1 cm^{-1}	5k Ω.cm - 100 MΩ.cm 0.5k Ω.cm - 10 MΩ.cm 50 Ω.cm - 1 MΩ.cm
Display resolution	Conductivity/resistivity: automatic point drift (min. resolution 0.001 µS/cm) < 0.1°C	
Display range	NH_3 9 < pH < 10 2.8 µS/cm < C1 < 28 µS/cm C2 < 0.5 µS/cm	
	NaOH 9 < pH < 10.7 2.5 µS/cm < C1 < 125 µS/cm C2 < 100µS/cm	
Accuracy	2 electrode	± 1% of displayed value temperature < ± 0.2°C
Calculated pH	Accuracy on conductivity measurement: 1% Max difference calculated-theoretical value: 0.1 pH	
Sample flow	5 to 20 L/h	
Temperature sensor	Pt 100	
Temperature compensation	No Automatic Manual	
Automatic temperature compensation range	0 to 150°C (32 to 302°F)	
Sensor type	2 electrode sensor	
Cable length	35m maximum. Junction box must be used for greater lengths.	

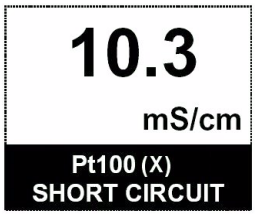
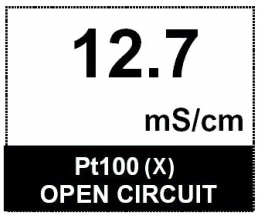
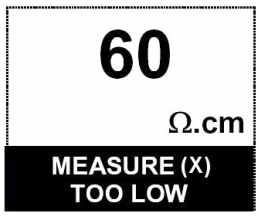
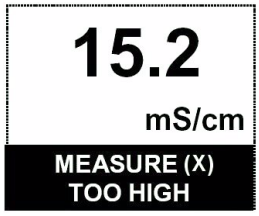
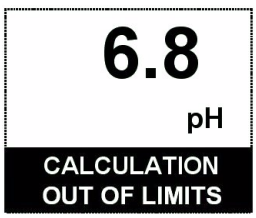
Table 6-1: Technical Specifications

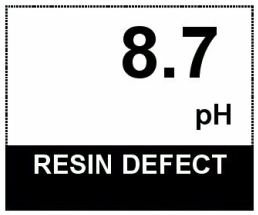
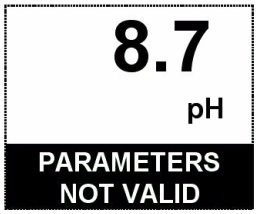
CALIBRATION	
Temperature calibration	± 10°C (± 50°F)
ANALOG OUTPUT	
Output signals	2 galvanically insulated outputs
Allocation	Conductivity/resistivity/temperature
Type	0 - 20 mA 4 - 20 mA
Mode	Linear Dual Logarithmic
Maximum load	800 Ω
Accuracy	Better than 0.1 mA
ALARMS	
Number	4
Function	Standard limits Alarm system Timer
Hysteresis	0 - 10%
Temporization	0 - 999s
Breaking power (resistive load)	250 VAC, 3A max 100 VDC, 0.5A max Use a cable (rated 105°C and AWG22 to 14). The external cable insulation should be cut as close as possible from the terminal block.
PROTOCOLS	
RS485	300 to 9600 baud 32 stations max. Modbus (RTU mode)
Profibus-DP	9.6 Kbit/s to 12 Mbit/s 127 stations max. (with repeater)
PROGRAMMING	
Language	French, English, German, Italian, Spanish, Dutch
Display	Icons + graphic zone (80 * 64 pixels)
Protection codes	Calibration, Programming, Service

7 Error Messages

7.1 Error Messages - Measurement

Note:
In all the error messages illustrated below, (X) will indicate the channel number (1 or 2).

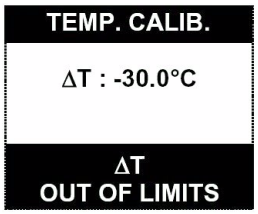
Error Message	Description
Error Messages During a Measurement	
	Sensor not correctly connected Temperature sensor damaged Replace it if necessary.
	Sensor not correctly connected Temperature sensor damaged Replace it if necessary.
	The resistivity or conductivity value is less than the lower limit of the measuring range.
	The resistivity or conductivity value is greater than the upper limit of the measuring range.
	The pH calculation is outside the valid limits: • NH_3: 7 < pH < 10 • NaOH: 7 < pH < 10.7

Error Message	Description
	The estimated life expectancy of the resin has been reached.
	The conductivity requirements have not been met: • NH_3: 2.8 µS < Cond1 < 28 µS ; Cond2 < 0.5 µS • NaOH: 2.5 µS < Cond1 < 125 µS ; Cond2 < 100 µS

Note:
*If the instrument is set up for manual acceptance, press **Enter** after correcting the problem to remove the error message from the screen.*

7.2 Error Messages - Calibration

Note:
*Press **Esc** to exit from the menu and calibrate again.*

Error Message	Description
Error Messages During a Calibration	
	The temperature drift is greater than the programmed limit. Limits: ± 10°C

Appendix A: Spare Parts

Table A-1: Spare Parts

Description	Reference
Conductivity probe	08310=A=0000
Cable for 8310 probe (1 meter)	09123=A=8001
Dual measurement cell	09123=C=0100
Sample flow adjustment valve	09184=C=4010
O Ring for flow regulation valve	429=042=019
Outlet quick connector	583=012=012
Flow cell closure (to be removed for operations)	431=201=018
Inner tube for resin cartridge, ss316	09123=C=0400
Spare resin cartridge complete with resin	09123=A=7000
Resin kit (includes 2 filters, 2L sachet of resin, funnel, instructions)	09123=A=7010
Flat gasket, Viton	09123=C=0500
Cationic resin cartridge (empty)	09123=C=0200
Resin cartridge closure	09123=C=0300
Resin cartridge filter	09123=C=0600
Sample outlet tube (1 meter)	359110,52012
Cationic resin (2 liter)	910=024=008
9125 equipped CPU board	09125=A=1001
9120 Dual complete conductivity module	09120=A=1500
9125 power supply (standard version)	09125=A=2000
9125 power supply (low voltage version)	09125=A=2020
Relay board (option)	09125=A=4000
RS485 kit (JBUS/MODBUS manual + board)	09125=A=2485
Kit for Profibus DP with board for 91xx / 92xx and Operator Manual	09125=A=1485
Mounted transmitter housing	09125=C=3000
Cable gland PG11	425=110=221
Cable gland PG13,5	425=135=222
Strap FLEXPAC 7 PTS	351=007=001
English instruction manual	621=191=023
JBUS/MODBUS communication manual	621=991=000
Profibus DP Manual	621=191=100

Appendix B: User Configuration Table

Table B-1: User Configuration Table

		User Configuration	
Option	**Default Value**	**Selected Values**	**Date**
CALIBRATION - TEMP.CALIB.			
TYPE	Process		
CALIBRATION - PARAMETERS			
DATE	01/01/01		
SLOPE	100.0%		
T	0.0°C		
PROGRAMMING - MEASURE - PROBE			
K	1.00		
FREQ.	Auto		
PROGRAMMING - MEASURE - TEMP.COMP			
MEASURE	No		
TEMP.	25.0°C		
TREF.	25.0°C		
COEF.	2.0%		
PROGRAMMING - ALARMS - ALARM 1			
AFFECT	S		
LIMIT	10.0 mS		
DIRECTION	Down		
DELAY	000 seconds		
HYSTERESIS	0%		
RELAY	NO		
PROGRAMMING - ALARMS - ALARM 2			
AFFECT	S		
LIMIT	10.0 mS		
DIRECTION	Down		
DELAY	000 seconds		
HYSTERESIS	0%		
RELAY	NO		

Table B-1: User Configuration Table

		User Configuration	
Option	**Default Value**	**Selected Values**	**Date**
PROGRAMMING - ALARMS - ALARM 3			
AFFECT	S		
LIMIT	10.0 mS		
DIRECTION	Down		
DELAY	000 seconds		
HYSTERESIS	0%		
RELAY	NO		
PROGRAMMING - ALARMS - ALARM 4			
AFFECT	S		
LIMIT	10.0 mS		
DIRECTION	Down		
DELAY	000 seconds		
HYSTERESIS	0%		
RELAY	NO		
PROGRAMMING - mA OUTPUTS - OUTPUT 1			
AFFECT	S		
TYPE	4-20 mA		
MODE	Linear		
LOWER	1.0 µS		
UPPER	10.0 µS		
PROGRAMMING - mA OUTPUTS - OUTPUT 2			
AFFECT	°C		
TYPE	4-20 mA		
LOWER	0°C		
UPPER	100°C		

Table B-1: User Configuration Table

		User Configuration	
Option	**Default Value**	**Selected Values**	**Date**
PROGRAMMING - mA OUTPUTS - SPECIAL PROG. - MAINTENANCE			
MODE	Last		
PROGRAMMING - mA OUTPUTS - SPECIAL PROG. - TIMER			
MODE	Last		
PROGRAMMING - mA OUTPUTS - SPECIAL PROG. - CALIBRATION			
MODE	Last		
PROGRAMMING - MEASURE - SPECIAL PROG. - SYST.ALARM			
MODE	Last		
PROGRAMMING - RS485			
NO	1		
BAUD	19200		
PARITY	No		
STOP BIT	1		
SWAP WORD	No		
SERVICE - AVERAGE			
AVERAGE	1		
SERVICE - DISPLAY			
UNIT	S/cm		
TEMP	°C		
LANGUAGE	GB		
SERVICE - CODE			
CALIB.	0000		
PROG.	0000		
SERVICE	0000		

Appendix C: Material Safety Data Sheets (MSDS)

C.1 Cationic Resin

Table C-1: MSDS - Cationic Resin

1. IDENTIFICATION OF THE SUBSTANCE
Product name: Styrene-divinylbenzene-copolymer with sulphonic acid

2. COMPOSITION / INFORMATION ON INGREDIENTS
CAS no: 68037-26-3
1. Styrene-divinylbenzene-copolymer with sulphonic acid groups in H-form - 40-55% (weight)
2. Water - 45-55% (weight)

3. HAZARDS IDENTIFICATION
Risk of serious damage to eyes.

4. FIRST AID MEASURES
Upon inhalation of aerosol/vapour/dust: Take the patient into the fresh air; if there is difficulty in breathing, medical advice is required.
Skin contact: After contact with skin, wash immediately with plenty of water and soap. Take off immediately all contaminated clothing.
Eye contact: Contamination of the eyes must be treated by thorough irrigation with water, with the eyelids held open. A doctor (or eye specialist) should be consulted immediately.
Upon swallowing: If product is swallowed, make the patient drink water. Wash out mouth repeatedly. If the patient feels unwell, seek medical advice.
After skin contact: wash off with plenty of water. Remove contaminated clothing.

5. FIRE FIGHTING MEASURES
Extinguishing media: CO_2, foam, dry powder; for larger fires, water spray should be used.
Firemen have to wear self-contained breathing apparatus.

6. MEASURES IN CASE OF ACCIDENTAL SPILLAGE
Take up mechanically, fill in labelled, sealable containers; spilled product causes risk of slipping.

7. HANDLING AND STORAGE
Precautions should generally be taken against electrostatic charges according to the equipment used and the way the product is handled and packaged.
Static charges lead to agglomeration of dry beads.
Prevent heating above 40 °C and cooling below -20 °C.
Do not allow to dry out.
VCI storage class: 11
Storage period 22 months.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION
Wear goggles.
Wear gloves.
Avoid contact with eyes and skin.
Keep away from food and drink stuffs.
Do not eat, drink or smoke at work.
Wash hands before breaks and at end of work and use skin-protecting ointment.

9. PHYSICAL AND CHEMICAL PROPERTIES
Form: beads
Colour: beige to grey, opaque
Odour: odourless
Density: approx. 1,18 g/cm³
Bulk density: 720 to 820 kg/m³
Solubility in water: not applicable
pH value: approx. 1 in aqueous suspension
Ignition temperature: not below 150°C DIN 51794

10. STABILITY AND REACTIVITY
Thermal decomposition: No thermal decomposition when stored and handled correctly.
Hazardous decomposition products: No hazardous decomposition products when stored and handled correctly. Formation of carbon monoxide, carbon dioxide, sulfur dioxide and other toxic gases in the event of fire or during thermal decomposition.
Hazardous reactions: Contact with strong oxidising agents may cause hazardous reactions. No hazardous reaction when used as directed.

11. TOXICOLOGICAL INFORMATION
Acute oral toxicity (LD50): above 5000 mg/kg - tested in rats
Skin irritation: non-irritant - tested on rabbits
Eye irritation: corrosive, risk of serious damage to eyes - tested on rabbits

12. ECOLOGICAL INFORMATION

The product is insoluble in water. Therefore, ecological tests have not been conducted.
Do not allow to escape into waters, wastewater or soil.
Product does not add to the AOX-value of the sewage. (DIN 38409)

13. DISPOSAL CONSIDERATIONS

Do not empty into drains. Dispose of this material and its container at a hazardous or special waste collection point, according to local regulations and laws, e.g. by incineration in a suitable plant. Soiled, empty containers should be treated in the same way as the contents.

14. TRANSPORT INFORMATION

Not dangerous cargo. Irritating to the eyes.
Avoid temperatures below -20 °C.
Avoid heat above +40 °C.
Keep separated from foodstuffs.

15.REGULATORY INFORMATION

Labelling in accordance with the EEC directives:
Xi, hazard description: irritant styrene-divinylbenzene-copolymer with sulphonic acid groups
R 41: Risk of serious damage to eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

The above-mentioned data correspond to our current state of knowledge. They serve as a description of the products in regard to necessary safety measures and do not guarantee the described chemical properties. These indications describe the safety precautions to take against the related product and they are not a guaranty of the described product properties.

Annex

Tables and Illustrations

User Notes

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