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AutoCAT 9000™ Chlorine Amperometric Titrator: Product Overview

The world's first **automated** amperometric titrator dedicated to measurement of chlorine concentrations.

Amperometric Titrations for low-level chlorine detection

— Using USEPA-approved methods, the AutoCAT 9000 automatically performs the titration and calculates the results with accuracy in the parts per billion ($\mu\text{g/L}$) range.



Forward Titrations for free and total chlorine — The

detection limit for the forward titration is 1.2 $\mu\text{g/L}$ total chlorine.

Back Titrations for chlorine in wastewater — Determine total chlorine at the point of collection as low as 5.1 $\mu\text{g/L}$.

The AutoCAT 9000 also provides USEPA-approved tests for chlorine dioxide and chlorite—making it an ideal solution for facilities modifying current disinfection processes or implementing new disinfection technologies—and a test for sulfite following Standard Methods 4500 SO_3^{2-} , for use in process control.

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This page updated
May 27, 2003

9187 Chlorine Dioxide Analyzer

The Hach 9187 Chlorine Dioxide Analyzer

- Selective membrane avoids interferences from chlorine
- Premounted membranes for replacement in seconds
- Two years of consumables reduces cost of ownership
- Excellent repeatability
- Accurate readings at low levels (ppb)

a 9100 series product

Application – for drinking water treatment plants, industrial rinsing, and cooling towers

Chlorine dioxide (ClO_2) has been used as a disinfectant for municipal drinking water plants in Europe and the U.S. for over fifty years. The increase in the popularity of the use of chlorine dioxide as an alternative disinfectant to chlorine can be attributed to the need to minimize disinfectant by-products such as total trihalomethanes (TTHMs) and haloacetic acid (HAA5s). Chlorine dioxide is particularly effective in improving taste and removing odor in surface water systems with high organic loads. It is also used for industrial rinsing in the food and beverage industry as well as in cooling towers.

Selective membrane avoids interference from chlorine

One of the most common ways of producing chlorine dioxide is by mixing chlorite and chlorine. As a result, chlorine is usually present in water treated with chlorine dioxide. Therefore, it is particularly important to avoid interferences from chlorine when measuring chlorine dioxide. The Hach 9187 chlorine dioxide analyzer uses a membrane that allows the selective diffusion of chlorine dioxide molecules. This highly selective membrane avoids interferences from chlorine, bromine, and hydrogen peroxide inherent in conventional systems. The only potential interferent is ozone, which is rarely present in water treated with chlorine dioxide.

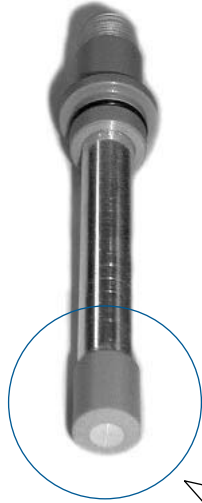
Two years of consumables reduces cost of ownership

The Hach 9187 chlorine dioxide analyzer is supplied with consumables for up to two years of operation. The consumables consist of a kit containing four membranes and electrolyte solution. The membranes are pre-mounted to allow replacement in seconds without interrupting sample flow.

Excellent repeatability and accuracy at low levels

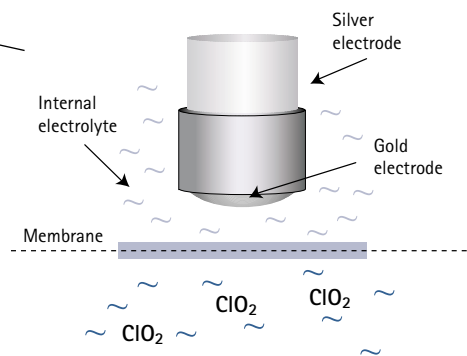
This analyzer is suitable for measuring a wide range of chlorine dioxide levels throughout the treatment process. The 9187 can accurately measure ppm levels at the point of addition down to ppb levels in finished water.





Principle of operation

The chlorine dioxide probe utilizes amperometric measurement technology based on the Clark cell principle. The amperometric probe is made up of a gold working electrode where the main reaction occurs, a silver counter-electrode, an electrolyte, and a porous membrane that isolates the electrochemical cell from the sample and through which chlorine dioxide diffuses. The chlorine dioxide molecules in the sample diffuse through the membrane to a thin region between the membrane and the cathode that contains the electrolyte.



A fixed potential is set between the two electrodes causing:

- a reaction at the cathode (gold) resulting in a reduction of chlorine dioxide to form chloride ions
- a reaction at the anode (silver) resulting in oxidation of silver to form silver chloride

The current generated is proportional to the concentration of chlorine dioxide originally present in the sample. The electrochemical reaction and diffusion through the membrane are temperature dependent. The measurement cell contains a temperature sensor for automatic temperature compensation to prevent measurement errors.

Controller Operation

The Hach 9187 is equipped for today's modern communications. The controller comes standard with a 4-20 mA recorder output, four alarm relay contacts, and a digital RS485 output utilizing the industry standard Modbus protocol. This connection provides cost effective, single wire connection to most PLCs and many SCADA systems. Intelligent menus quickly guide operators through common functions from initial start-up to daily operation. Menus are conveniently arranged to group similar functions for easy access. The display screen provides local access for programming or readout.



Kit includes four pre-mounted membranes for easy replacement and up to two years of operation

9187 Chlorine Dioxide Analyzer Specifications*

Range

0.01–2 mg/l ClO₂

Repeatability

< ± 5% of reading or < ± 0.01 mg/l ClO₂, whichever is greater

Minimum Detection Limit

< 0.01 mg/l ClO₂

Response Time

T90 approximately 3 minutes

Sample Flow Rate

200–250 mL/min.

Sample Pressure

Minimum 0.22 psi.

Sample Temperature Range

0° C to 35° C (32° F to 95° F)

Operating Temperature Range

0° C to 45° C (32° F to 113° F)

Relative Humidity

10 to 90% non-condensing

Recorder Outputs

Analog outputs: two 0/4–20 mA outputs, maximum impedance 500 Ohms

Relay Outputs

Alarms: four alarm relays; 3A, 240 VAC maximum

Digital Communication

RS485 (Modbus protocol)

Power

Auto-ranging 100–240 VAC ± 10%, 50/60 Hz, 90 VA, 2A fuse

Sample Inlet Connection

1/4-inch OD

Sample Outlet (Drain Connection)

5/16-inch OD

Compliance/certification

CE, UL 3101-1, CSA C22.2 No. 1010.1

Controller Enclosure

Enclosure: polyester-coated aluminum;
IP65 Weight: 2.3 kg (5 lbs)

Controller Dimensions

144 x 144 x 150 mm
(5.6 x 5.6 x 5.85 inches)

Mounting

Wall mount, panel mount, or pipe mount

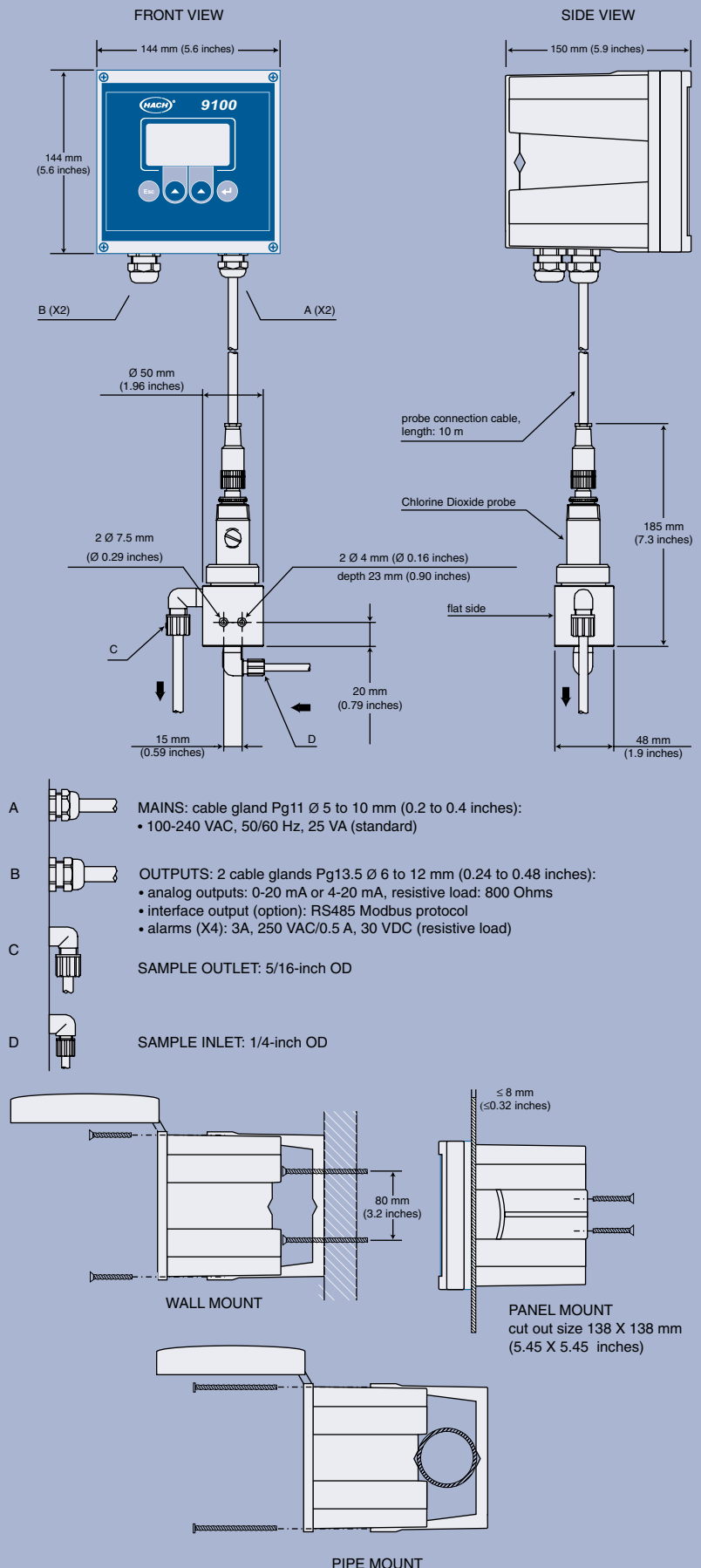
Probe construction

PCA measuring cell with gold cathode/silver anode electrodes

* Subject to change without notice.

Installation

The Hach 9100 controller can be mounted virtually anywhere: wall, panel, or pipe mounted. No additional hardware is required.



How to Order

The Hach 9187 Chlorine Dioxide Analyzer is shipped complete with controller, probe, cable, flow cell and all hardware necessary for installation. Up to 24 month supply of electrolyte and pre-mounted membranes are also included with every analyzer. Power cords are sold separately and a Constant Head Device is also available to ensure a steady sample flow to the analyzer.

Complete Analyzer

19187=A=0011 Hach 9187 Chlorine Dioxide Analyzer, 100-240VAC

Accessories for 9187 Chlorine Dioxide Analyzer

09185=A=1700 Constant head device

46306-00 Power cord 125V

46308-00 Power cord 230V

Spare Parts

09187=A=1000 9187 electrode without cable

09187=A=3500 Box of 4 premounted membranes

19187=A=3600 Bottle of electrolyte (100 ml)

09180=A=8010 Probe cable 10 m (32.8 ft.)

09180=A=8005 Probe cable 0.5 m (1.5 ft.)

Typical Proposal Specification

The chlorine dioxide analyzer shall employ an Amperometric method of measurement using a permeable membrane selective to Chlorine Dioxide that rejects interference by free Chlorine. The analyzer shall consist of a microprocessor-based control unit connected to a probe with built in temperature measurement and compensation. The probe shall sit in a flow through cell to which the sample is delivered.

The analyzer power requirements shall be 100-240 VAC, 50/60Hz. The controller shall be housed in an IP65 rated aluminum housing designed for wall or pipe mounting.

The analyzer measurement range shall be from 10 to 2000 µg/L (0.01 to 2 mg/L) and shall have a response time (T90) of less than 3 minutes. The controller's operating temperature range shall be from 0 to 45°C. Repeatability shall be ±10 µg/L or 5% of reading, whichever is greater. Calibration options shall include an electrical zero, chemical zero and calibration by comparison.

The system shall provide menu-driven configuration of measurement and control functions via front-panel-mounted touch-sensitive switches. Menus and measurement results shall be viewable on a back-lit liquid crystal display. Measurement shall be reportable via 0/4-20 mA outputs and via a digital RS485 output using Modbus protocol. In addition the system shall provide four alarm relays that can be configured to system alarm, timer alarm and threshold values based on concentration.

The entire process monitoring system shall be designed to meet UL 3101-1, CSA C22.2 No. 1010.1, and CE safety standards.

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Telephone: 800-227-4224
Fax: 970-669-2932
E-mail: orders@hach.com
Website: www.hach.com



Be Right™

Chlorine dioxide analyser Model 9187



Applications

On-line monitoring of chlorine dioxide for :

- Drinking water treatment plants
- Industrial rinsing and cooling waters

Features

- Selective measurement of chlorine dioxide
- No reagent
- Minimal maintenance requirements
- Excellent repeatability
- User-friendly menu-based programming
- Two smart analog outputs with automatic recognition of the analyser status

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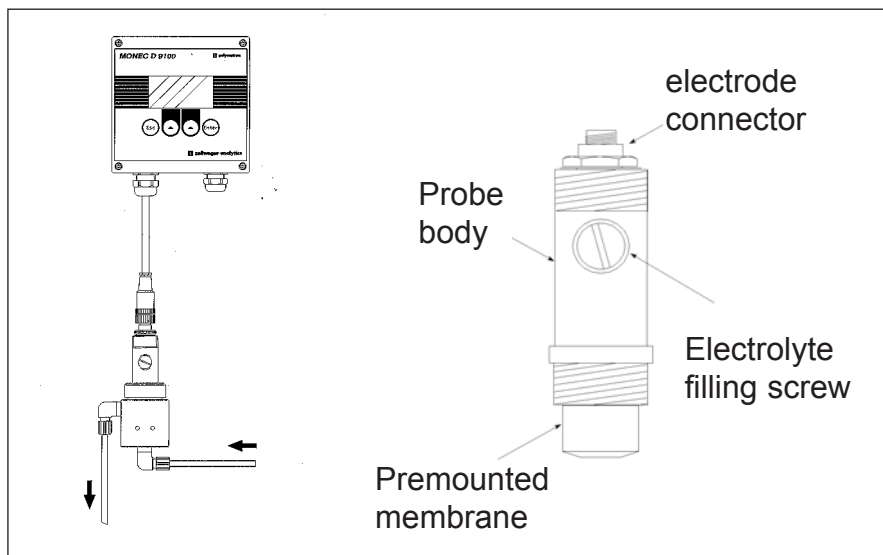
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Distributor

TE 9187=A=100 - Rev. D - FR. 50622048726



Sample	Temperature Particulates Pressure / Flow	+0...+45°C, +32...113°F No suspended solids Cell outlet at atmospheric pressure 12-30 l/h
Connections	Sample Drain Power supply Mounting	Tube 4 x 6 mm P.E Tube 6 x 8 mm P.E 90...265VAC, 50/60Hz, ~25VA Transmitter + probe (10 m cable)
Analysis	Measuring range Repeatability Low detection limit Response time (t=90%) Ambient temperature Calibration Interference	0..2 mg/l ClO ₂ < +/- 5 % of measure or < +/- 0.01 mg/l ClO ₂ whichever is greater < 0.01 mg/l ClO ₂ ~ 3 minutes 0...+45°C, +32...+113°F Zero : electrically or with chlorine dioxide free water Slope : process using a reference method Chlorine, bromine do not interfere Ozone does interfere
Transmitter	Protection CE regulations Analog outputs Analyser status information Relays Temperature compensation	IP65 / NEMA 4 X EN50081, EN50082 (EMC) and IEC61010 (low voltage) 2 x 0/4... 20 mA isolated, 800 Ohms load max : for concentration (linear or bi-linear) and/or for temperature (linear) 4/20 mA outputs programmable to a value between 0 and 21mA during calibration or when system alarm is activated 4 dry contacts NO/NC (250VAC, 3A / 30VDC, 0.5A max. ohmic load) for : - high/low limits (programmable delay and hysteresis), - system alarm with manual or automatic acknowledgement, - timer (programmable frequency and sequence) Automatic within the range 0 - 45°C (32 - 113°F)
Options	RS 485 Zero cartridge Overflow vessel	300..9600 bauds, 32 stations max., JBUS/MODBUS. To perform on-line chemical zero calibration To maintain a constant sample flow
Materials	Electrodes Measuring cell	Gold cathode/ Silver anode PVC
Maintenance	Every 1 to 3 months Every 4 to 8 months	Check calibration Change membrane and electrolyte

**9187 CHLORINE
DIOXIDE
ANALYSER
UTILIZATION
MANUAL**

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Warning

Any use that does not comply with that described in this manual may lead to risks for the user. Furthermore, this latter cannot change any of the sensor or transmitter's components. Only **Polymetron** staff, or its approved representative, is authorised to repair the system and only components explicitly approved by the manufacturer can be used.

Any attempts to repair the instrument that go against these principles may cause damage to the equipment or to the person performing the repairs.

It also cancels the guarantee and may compromise the instrument's safety, electrical integrity or EC compliance.

1. Presentation of the instrument

Introduction

The 9187 chlorine dioxide analyser is a single channel industrial analyser for the selective measurement on line of chlorine dioxide in drinking water treatment plants, distribution networks and all applications demanding the monitoring of chlorine dioxide in the ppb and ppm ranges.

Measurement is carried out using an amperometric method after diffusion of the chlorine dioxide molecules through a membrane.

Measurement principle

The measurement of chlorine dioxide relies on the principle of the Clark cell.

This amperometric sensor is made up of:

- a gold work electrode where the main reaction occurs,
- a silver counter-electrode,
- an electrolyte,
- a porous membrane that isolates the electrochemical cell from the sample and through chlorine dioxide diffuses:

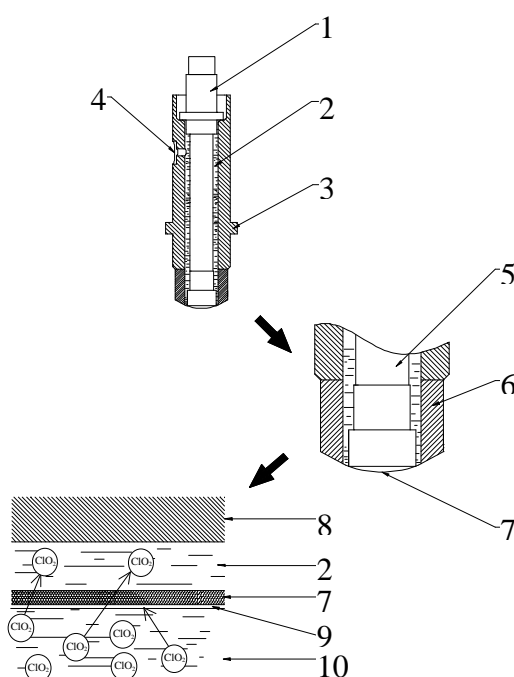


Figure 1.1

- 1 Assembled electrode
- 2 Electrolyte
- 3 Probe body
- 4 Filling orifice
- 5 Anode
- 6 Membrane holder
- 7 Membrane
- 8 Cathode
- 9 Membrane interface / sample
- 10 Sample

The molecules of chlorine dioxide contained in the sample diffuse through the membrane and are then found in an electrolyte zone of very slight thickness between the membrane and the cathode.

A constant work potential is applied to the work electrode (cathode) where ClO_2 is reduced according to the reaction: $\text{ClO}_2 + 5\text{e}^- + 4\text{H}^+ \rightarrow \text{Cl}^- + 2\text{H}_2\text{O}$.

At the silver electrode (anode) the silver is oxidised to Ag^+ : $\text{Cl}^- + \text{Ag} \rightarrow \text{AgCl} + \text{e}^-$.

The reduction in chlorine dioxide at the cathode generates a current that is directly proportional to the partial pressure of it in the sample.

The electrochemical reaction and diffusion through the membrane are dependent upon temperature, a consequently the measurement cell is fitted with a temperature sensor will enable the automatic compensation of measurement variations according to temperature.

2. Description of the ANALYSER

Synoptic of the instrument

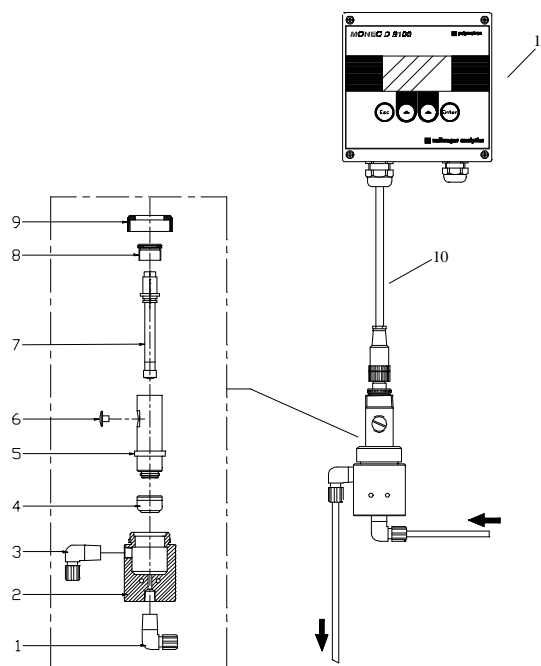


Figure 2.1

- 1 Inlet connector (for DN4/6 tube)
- 2 Cell
- 3 Outlet connector (for DN6/8 tube)
- 4 Membrane
- 5 Electrode body
- 6 Filling stopper
- 7 Electrode
- 8 Clamping nut
- 9 Cell cap
- 10 Probe cable
- 11 Transmitter

3. Technical specifications

Transmitter dimensions

Dimensions are given in mm and in inches.

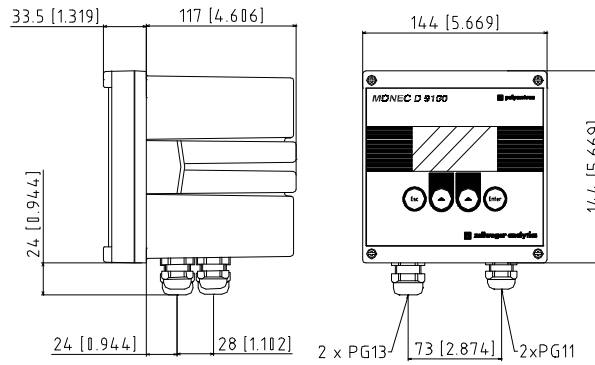


Figure 3.1

Cell dimensions

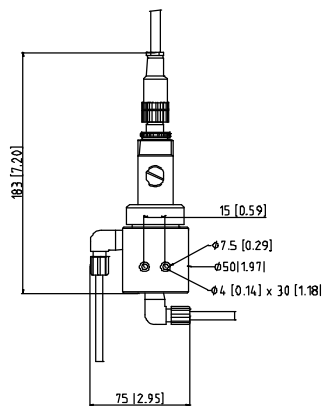


Figure 3.2

(Dimensions are given in mm and in inches).

General properties

- Measurement range: 0 to 2 mg/l
- Temperature compensation
- Programmable thresholds, relay outputs
- 4-20 mA and 0-20 mA outputs, standard alarm relays and optional RS 485

This instrument complies with the following standards:



- Immunity to electromagnetic disturbances EN 50082-2 and EN 50082-1
- Electromagnetic emissions EN 50081-1 and EN 50081-2
- Low voltage standard IEC61010-1

SAMPLE

Number of channels	1
Temperature	0-35 °C (32-95 °F)
Operating pressure	atmospheric pressure
Output	10-30 l/h (12-15 l/h recommended)

CONNECTIONS

Sample inlet	Ø 4/6 PE tube
Sample evacuation	Ø 4/6 PE tube

CONDITIONS OF USE

Ambient temperature	- 20 to + 60 °C
Relative humidity	10 to 90 %

ANALYSIS

Measured quantity	ClO ₂
measurement range	0 .. 2 mg/l
Repeatability	± 10 ∞g/l or ± 5 % whichever is the greatest of these two values
Detection limit	< 10 ∞g/l
Response time (90 %)	< 90 s
Ambient temperature	0-45 °C (32-113 °F)
Interference	Ozone
Analogue outputs	Maximum load 800 Ohms 2 x 0/4... 20 mA galvanically insulated, assigned to measurement or to temperature, linear, bi-linear, precision: 0,1 mA

Alarms	Number: 4 Functions: threshold system alarm - timer Hysteresis: 0-10 % Delay: 0-999 s Breaking power: 250 VAC, 3A maximum, 30 VDC, 0.5A maximum
Temperature compensation	Automatic in the 0-45 °C range (32-113 °F)
RS485 (option)	Speed: 300-9600 bauds Galvanic insulation Number of stations: max. 32.
Transmitter seal	IP65 (NEMA 4X on option)
Error indication	0 < cell current > 999 μ A Sample temperature > 45 °C (113 °F) or < 0 °C (32 °F)
Maintenance	No specific maintenance is required. The instrument may be cleaned with a soft cloth and without any abrasive products

MATERIALS

Work electrode	Cathode: gold
Counter-electrode	Anode: silver
Membrane holder	PVC
Transmitter	Aluminium with polyester paint
Probe body	PVC

MAINTENANCE

Approximately sample life membrane	between one and six months according to sample
Units	μ A, ppb- μ g/l, ppm-mg/l, °C, °F
Calibration	Electrical zero, chemical zero with dechlorinated water, calibration process of the slope by comparison with a laboratory measurement

TRANSMITTER

Display	Concentration unit indicator Direct display of concentration or cell current in μ A Sample temperature display in °C, °F menu-assisted programming
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Using the mounting plate (optional) and other accessories (optional)

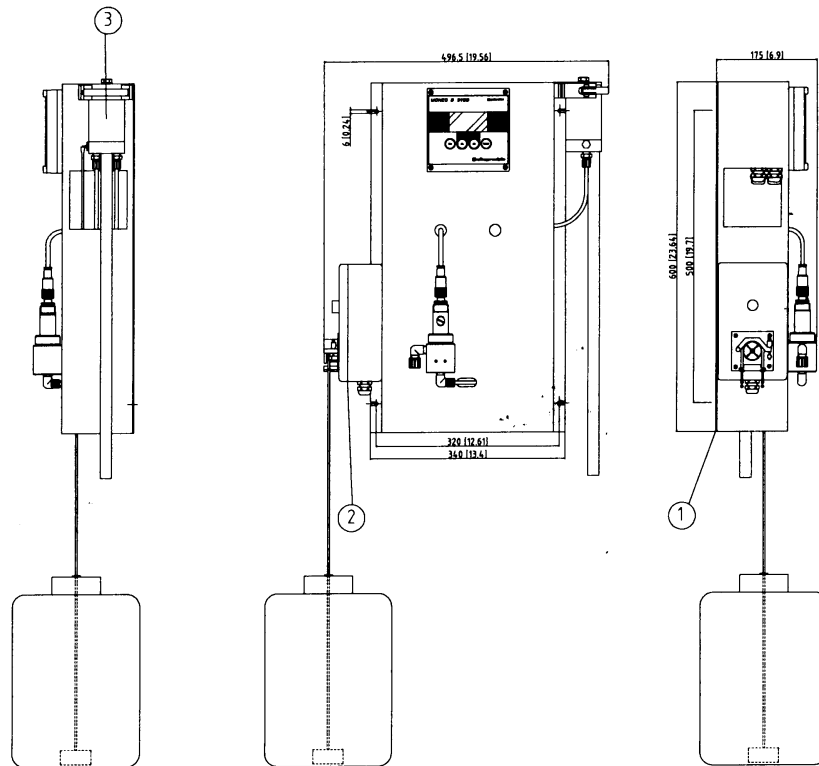


Figure 3.3

- 1 Wall mounting plate
- 2 Chemical cleaning assembly
- 3 Overflow pot

Optional equipment:

1: Wall mounting plate

Ref: 09184=C=2700

Allows compact wall mounting of the apparatus.

2: Chemical cleaning assembly

Ref:

09184=A=2500 (220/240 VAC , 50/60 Hz)

09184=A=2510 (110 VAC , 50/60 Hz)

09184=A=2524 (24 VAC , 50/60 Hz)

This assembly includes the pump, the can of reagent and a complete set of hoses.

The use of the overflow pot ref 09184=A=1800 and the mounting plate 09184=C=2700 are recommended with this option (See figure).

3: Overflow pot

Ref: 09184=A=1700

Allows a constant output (about 15 l/h) through the measurement cell.

This option is recommended in cases where the output of the sample is subject to strong variations.



WARNING:

In the case of the joint use of a cleaning assembly, the overflow pot to be used is different (pump connection) and carries the reference 09184=A=1800.

**These assemblies include the overflow pot ready for use with the interconnection hoses and its attachment.
(The hydraulic and electrical connection diagrams are supplied with the options).**

Transmitter section

Presentation of the transmitter

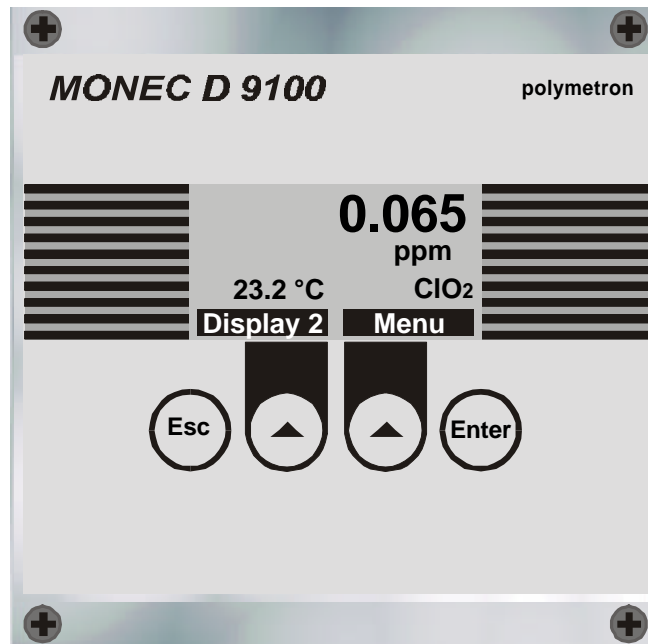


Figure 3.4

The transmitter amplifies the signal generated by the amperometric measurement cell and converts it to a direct digital read-out in ppm, mg/l, ppb, ∞ g/l, °C and °F. The transmitter is made up of the following elements:

- Potentiostat controlling the potential of the work electrode
- Amperometric measurement module.
- Analogical multiplexer.
- Microprocessor.

The analogue multiplexer allows measurements to be made at the cell, temperature sensor and at the instrument's internal control points. Next, the microprocessor controls the relays, the RS485 serial interface (optional) and the analogue outputs.

The unit possesses an integrated automatic range switch, along with microprocessor-controlled calibration.

The potentiostat output is continuously controlled by the microprocessor in order to detect any anomalies. This condition may arise with open cell connections, inoperative electrodes or a faulty anode.

The transmitter synoptic is as follows:

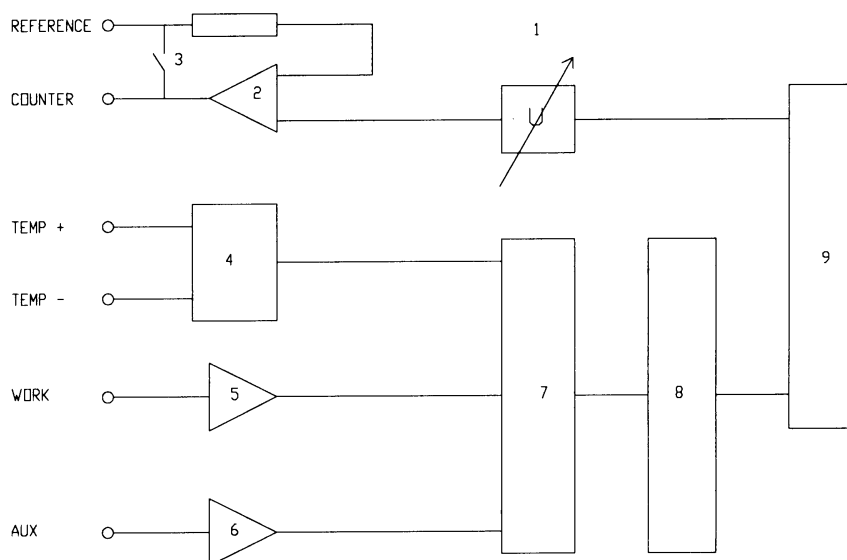


Figure 3.5

- 1 Programmable potentiostat
- 2 Polarising voltage amplifier
- 3 Switch for 2- or 3-electrode operation
- 4 Temperature measurement circuit
- 5 Measurement circuit current amplifier
- 6 Auxiliary input
- 7 Multiplexer
- 8 A/D converter
- 9 Microprocessor

Fields of use

Simple to use (installation, programming), this microprocessor instrument can be used for the following applications:

- potable water treatment,
- distribution network.

Standard transmitter mounting possibilities (use of the red clamp)

The housing complies with the DIN 43700 standard.

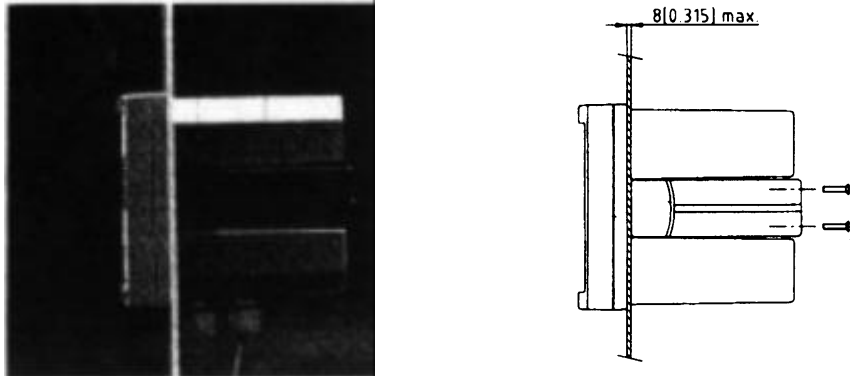


Figure 3.6

Fitting onto a specific panel

Panel cut-out : 138 X 138 mm

Front dimensions : 144 x 144 mm

Panel thickness : 1 to 8 mm

⇒ 2 M 4 mm screws, width 18 countersunk heads (provided)

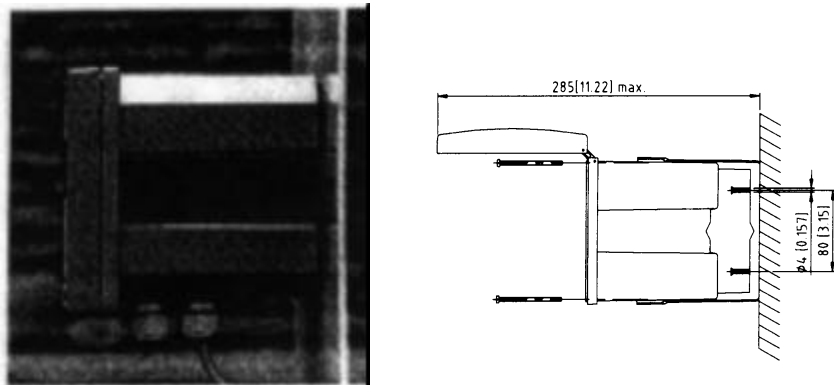


Figure 3.7

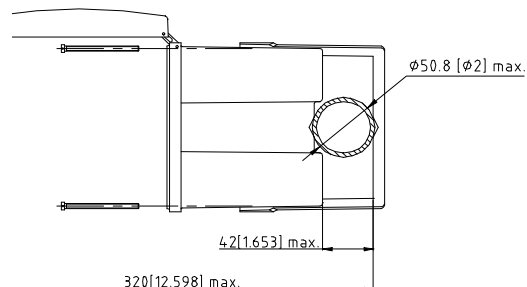
Wall mounting

⇒ 2 M 4 mm screws, width 60 countersunk heads (not supplied) / 1 80 mm base



Vertical tube mounting

⇒ Ø 50 mm maximum - 2 M 4 mm screws width
(not supplied)



Horizontal tube mounting

⇒ Ø 50 mm maximum - 2 M 4 mm screws width
(supplied)

Figure 3.8

4. Installation

Unpacking

The instrument should be unpacked carefully. Make sure that no accessories are lost during unpacking.



WARNING:

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

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 damaged packaging could be the sign of damage not immediately visible. Keep the packaging in case of complaints. If any parts or accessories are missing, refer to your distributor or to:

Polymetron

Z.I. des Richardets

33, rue du Ballon

93160 NOISY-LE-GRAND

Assembly

The instrument simply requires connection of the sample, cell outlet and mains power supply, and eventually alarms and analogical signals.

Implantation

The analyser should be placed in an accessible location.

The sample supply line should be as short as possible. Avoid whenever possible sudden changes of pressure, output and sudden changes of section, ...

Do not place the instrument next to a heat source, which would cause degassing of chlorine dioxide present in the sample.

Ensure that there are no air inlets in the supply line.

Sample properties

Supply pressure must be sufficient to ensure analyser supply. A minimum pressure of approximately 15 mbar is sufficient to provide the correct flow rate.

In the case of very hard water (high °TH), it may be necessary to fit an acidification system (c.f. options) in order to prevent the formation of deposits on the instrument.

Sample throughput must not vary too brutally, or measurement variations may occur.

In the case of such instabilities, the use of a overflow vessel (c.f. options) should allow normal operation to be restored.

Electrical connections

MONEC

Do not provide power to the instrument before its complete installation.

An aluminium shielding plate inside the Monec provides details of the role of the various terminal strip contacts, along with their connection to external elements.

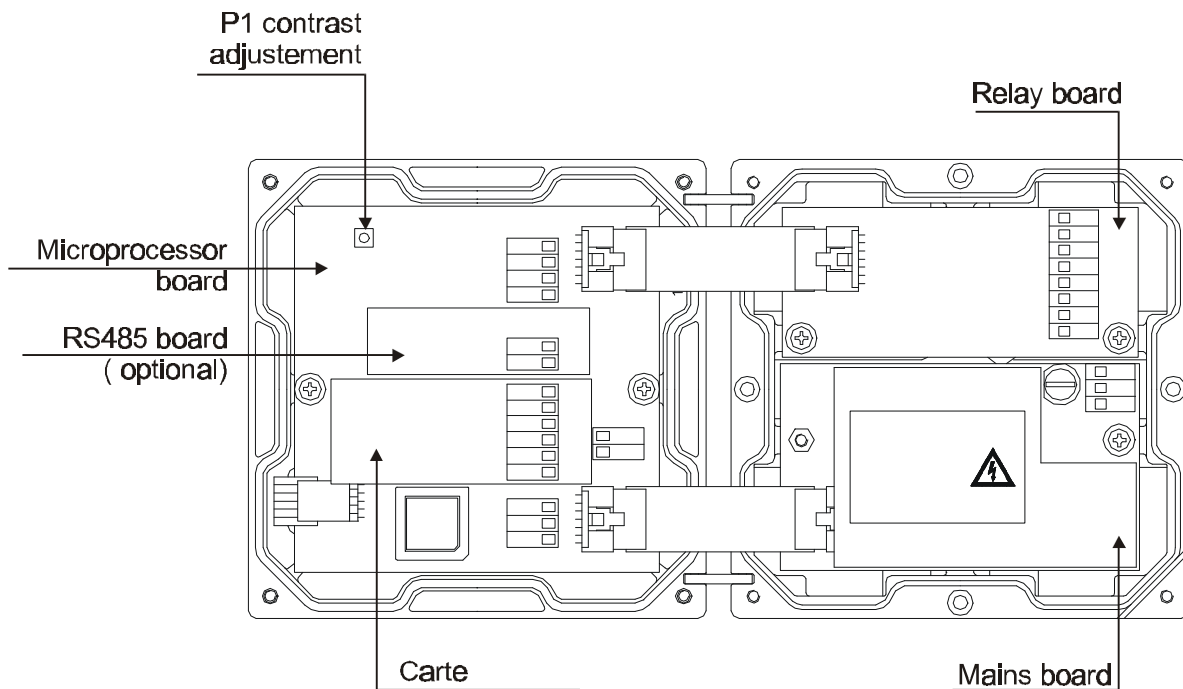
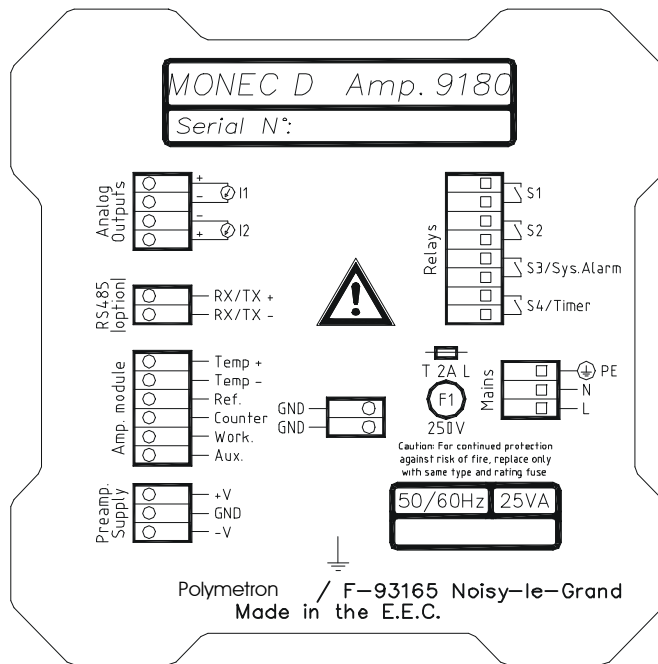


Figure 4.1

The various terminal strips represented on the right are accessible by removing this shielding plate.

Refer to appendix 6 for connection details.

Electrical connections must always remain dry and clean in order to ensure reliable instrument operation. Ensure that the cables are positioned correctly when opening the transmitter.

We recommend the use of shielded cables. Shielding should be connected to the earth terminal of the central shielding.

Mains connection

Electrical installation should be performed by duly qualified staff. A main voltage of 100-240 VCA \pm 10% is acceptable without altering the configuration. The power supply terminal strip can be removed from its housing in order to facilitate connection.

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

- Use a 3-wire mains lead (2 phases plus earth) with an appropriate cross-section for the required power.
- 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. On the other hand, the earth protection conductor should always be connected.

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

Transmitter start-up

Prior to powering up, ensure that the site's voltage corresponds to that stated on the instrument's identification plate.

Adjusting display contrast

If your display's 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 housing (see figure page 4-1).

5. Programming

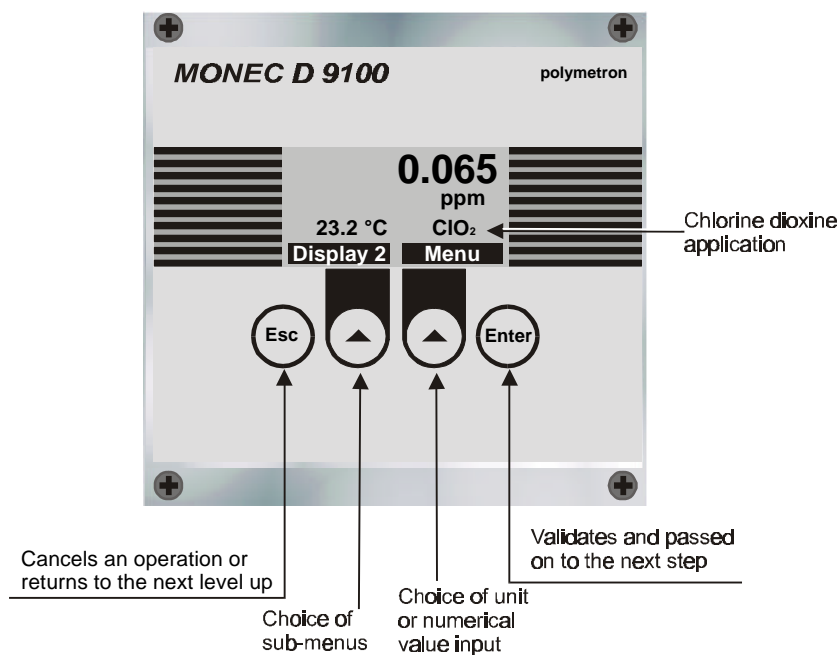


Figure 5.1

The display can be controlled to show:

- Sample concentration
- Sample temperature
- Diffusion current
- Programming codes
- Programming parameters

General

Programming structure

The programming structure of the 9187 comprises 3 levels:

LEVEL 1 : Display mode

LEVEL 2 : Menu mode

LEVEL 3 : Programming and operating mode

Passage from level 1 to 2 is achieved by pressing the function key under the highlighted "menu".

Make your selection using the function key under the highlighted "SELECT" option.

Passage from level 2 to 3 is available only for the PROGRAMMING and **SERVICE** menus, using the "Enter" key.

Press "SELECT" to select a sub-menu.

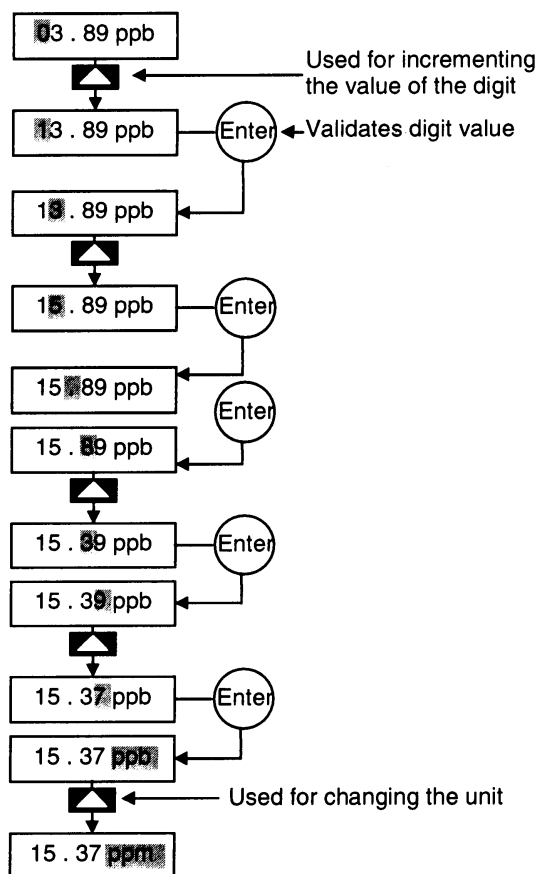
Entering or changing a value:

The highlighted digit can be altered using the function key.



Validate each digit using the "Enter" key. Repeat these two operations for the other digits.

Example:



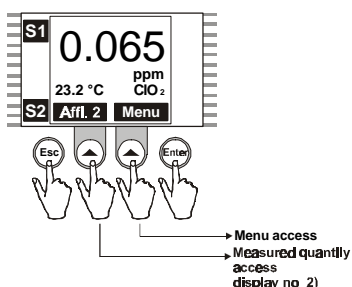
**On the 1st digit: ability to display the "-" sign
On the other digits: ability to display a "."**

Remarks:

- If you do not touch any keys for over 10 minutes, the instrument returns to the main display.
- An access code for programming and maintenance can be defined (c.f. CODE menu §) in order to protect the configuration.
- An access code is systematically requested to access the "Polymetron menu".

Programming synoptic

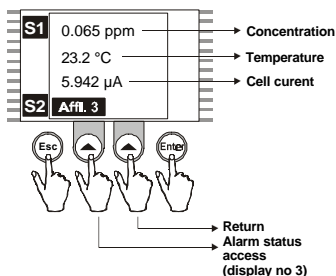
• **Start-up display**



- 0.065 ppm : concentration measurement (unit: ppm)
- 23.2 °C : temperature measurement
- CIO₂ : application: chlorine dioxine
- S1...S4 : alarm status (invisible is alarms deactivated)

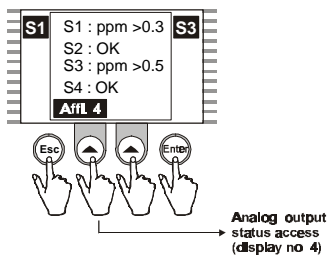
• **Measured quantities**

Display of measured quantities



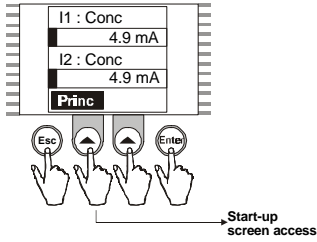
• **Alarm status**

S1...S4 : Alarm status
In this case, relays S1 and S3 are activated.



• **Analog output status**

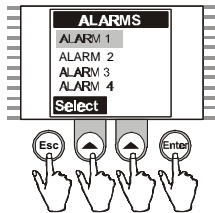
Analog output status



• **Alarms menu**

Relays S1..S4 may be assigned to threshold, system alarm and timer functions.

Relay S3 can also be assigned to the system alarm. Relay S4 can also be assigned to the timer.



• **Threshold function**

The alarm relays are activated if the comparison of the measured value with the programmed limit meets the alarm function condition (high or low). Set points are programmed from the following programming steps:

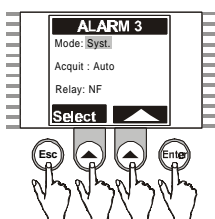


ALARMS 1 ... 4 (THRESHOLD)		
ASSIGN	- Conc. - No - °C/°F	used for selecting a temperature or concentration threshold, or relay not used
LIM	xxxx	Used for entering the threshold value
DIRECTION	- Up - Down	Selection of the up or down direction
TEMPO	xxxs	Definition of delay in seconds prior to relay triggering
HYST.	XX%	Definition of threshold hysteresis in % (max. 10%). Hysteresis only functions on the set point side. It is located below the set point for the upper alarm and above the lower alarm.
RELAYS	- NO - NF	Relay normally open or normally closed

- **System alarm function**

The S3 relay can be used to indicate a malfunction detected by the analyser. We recommend connecting the S3 relay to an external alarm device in order to control faults detected by the instrument.

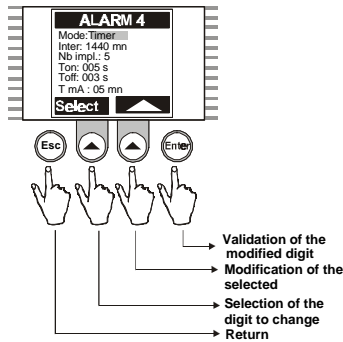
When a fault occurs, the S3 relay is activated. In the event of manual acknowledgment, the relay remains activated even if the fault disappears. You must press ENTER to deactivate the relay and accompanying error message. In the event of automatic acquittal, the relay and message are deactivated once the fault disappears.



ALARM 3 (SYSTEM ALARM)		
MODE	- No - Threshold - Syst.	For alarm 3, you have a choice between a threshold function (see following paragraph) and a system alarm function
ACQUIT	- Auto - Man.	In the system alarm case, you can choose between manual acquittal (ENTER key) or automatic acknowledgment
RELAYS	- NO - NF	Allows selection of S3 normally open or normally closed

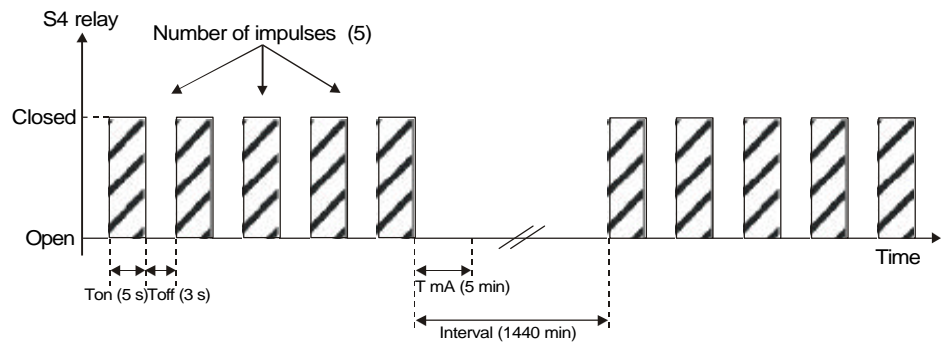
• **Programming - timer**

The S4 relay can be used for cyclical operation. The operating cycle is defined using the following programming steps:



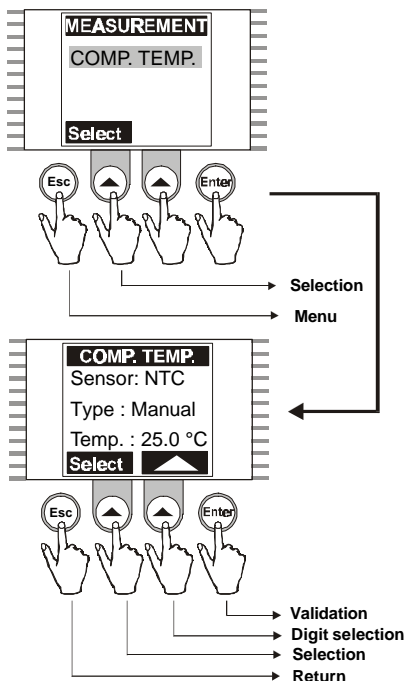
ALARM 4 (TIMER)		
MODE	- No - Threshold - Timer	For alarm 4, you have the choice between a threshold function (see previous paragraph) or a timer function
INTERV	XXXXmn	Setting of the time interval between two active cycles (in minutes)
Nb IMPUL.	X	Definition of the number of impulses during the active cycle
Ton	XXXs	Setting of the activation time in seconds for each impulse
Toff	XXXs	Setting of the deactivation time in seconds for each impulse
TmA	XXmn	Input of holding time for analogue outputs at the end of each cycle.

Timer operating cycle:



- **Temperature compensation**

Available from “Menu”, then “Programming”




TEMPERATURE COMPENSATION		
Sensor	NTC AD590	Type of temperature sensor. The NTC (default value) must be programmed
TYPE	- Auto - Manual	Used for selecting a temperature measurement with automatic or manual compensation. WARNING: If you select manual temperature compensation, the TEMP. CONTROL menu is no longer available.
TEMP.	xx.x °C	Used for entering the sample temperature during manual compensation

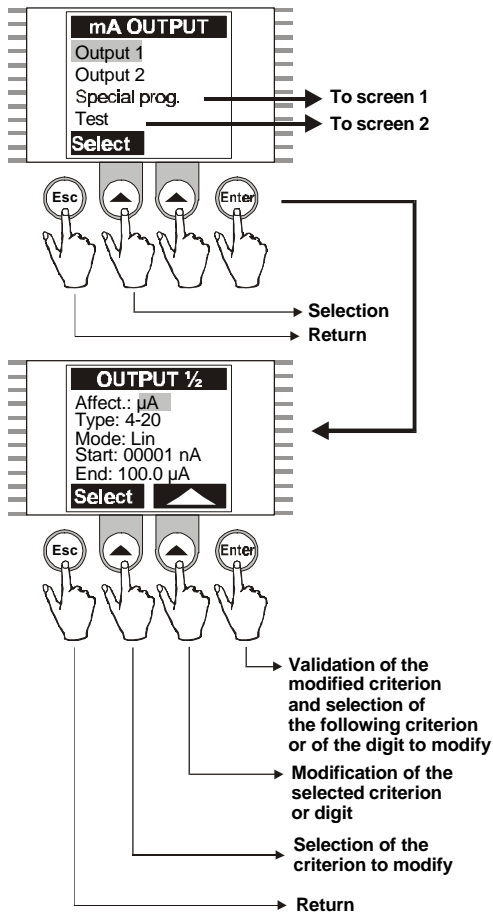
• **Programming - mA outputs**

The signals generated by the analogue outputs allow the measurements made by the analyser to be transmitted to any external control or recording device.

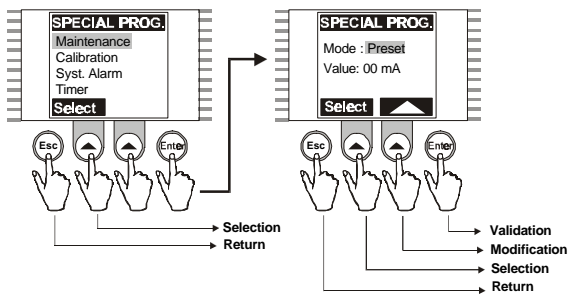
For output signals, we strongly recommend using a shielded cable. This shielding should be connected to the earth terminal on the shielding plate.

Select the digit to alter using the "SELECT" key then alter it using the key 

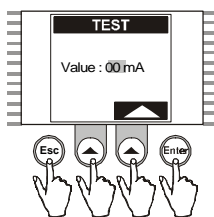
Validate using the "Enter" key.




Screen 1



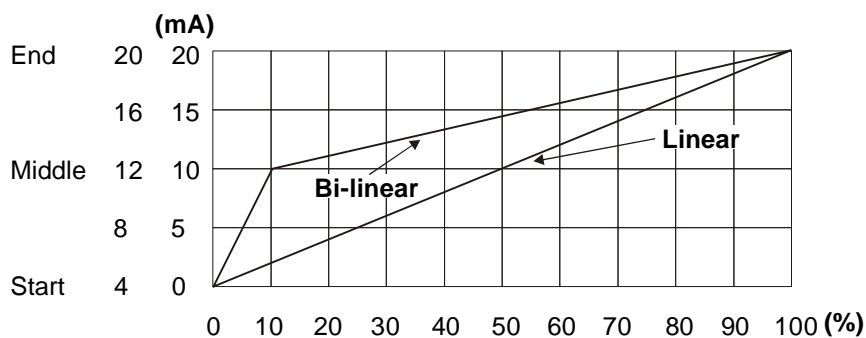
Screen 2



Change the value using the key  then validate with the "Enter" key.

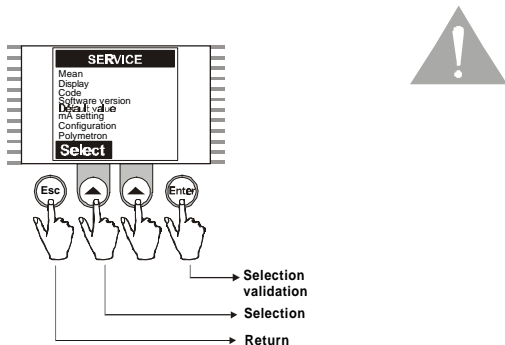
OUTPUTS 1/2		
ASSIGN.	- Conc. - ∞A - °C / °F	Used to determine whether the analogue output is assigned to current, concentration or temperature measurement
TYPE	0/20 4/20	Used for selecting the type of analogue output
MODE	- Lin - Bi-lin	Choice between linear and bi-linear scale (see diagram at bottom of page)
START	XXXX	Scale starting value
MIDDLE	XXXX	Scale middle value (bi-linear)
END	XXXX	Scale ending value
SPECIAL PROG.		
MODE	- preset - last - live preset = last = live =	Behaviour of the analogue output during calibration, system alarm, maintenance or active timer cycles: Preset = return to a preset value Last = return to the last value before the event Live = live measurement
VALUE	XX	Used for defining the return value (0 to 21 mA)
TEST		Used for testing analogue outputs in 1 mA steps (0...21 mA)

Illustration of linear / bi-linear output loops:



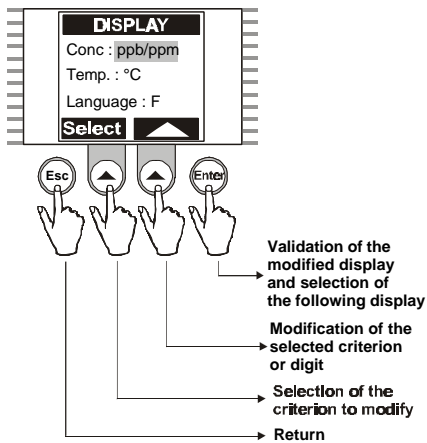
• **Programming - Service**

You may be required to enter an access code.



• **Programming - display**

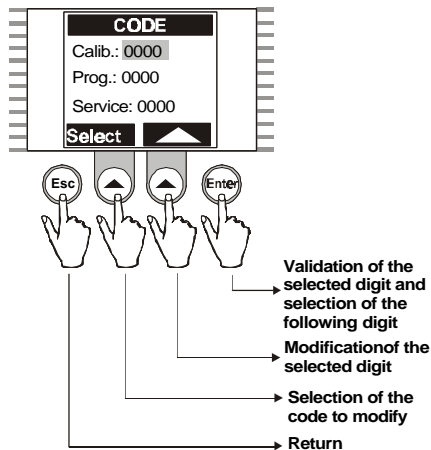
Accessible from “Menu” then “Service”, then “Display”.



DISPLAY		
CONC	- ppb/ppm - ∞g - mg/l	Used for selecting the concentration unit
TEMP.	- °C - °F	Used for selecting the temperature unit
LANGUAGE	- F - GB - D - SP - I	Used for defining the working language: - French - English - German - Spanish - Italian

Warning

The factory-defined programming language is English. This also applies after a software version change and after changing the default values.



• Programming - Code

Accessible from “Menu”, then “Service”.

Protection codes can be defined for accessing the PROGRAMMING, CALIBRATION and SERVICE menus.

This code can be deactivated by entering the figure 0000.

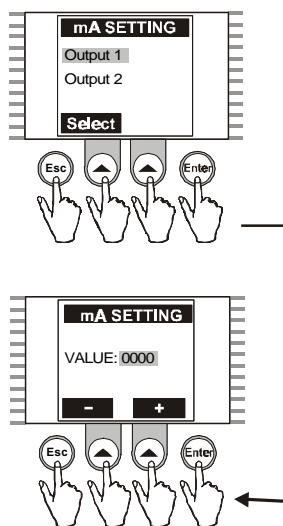
CODE		
CALIB	XXXX	Calibration access code
PROG.	XXXX	“PROGRAMMING” menu access code
SERVICE	XXXX	“SERVICE” menu access code



If you forget a protection code, press ESC and ENTER simultaneously to access the menu.

• Programming - mA settings

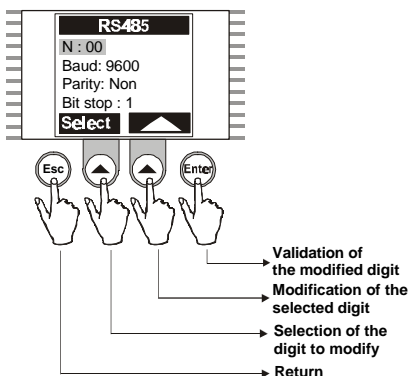
The analogue output signals are factory set (end of scale: 20 mA). However, if you notice a drift in the 20 mA on one or other output, you must use the following menu. Connect an ammeter to the terminals of the analogue outputs and adjust the value until 20.0 mA is displayed on the ammeter



Warning

The value represents a drift and does not, under any circumstances, correspond to the value in mA.

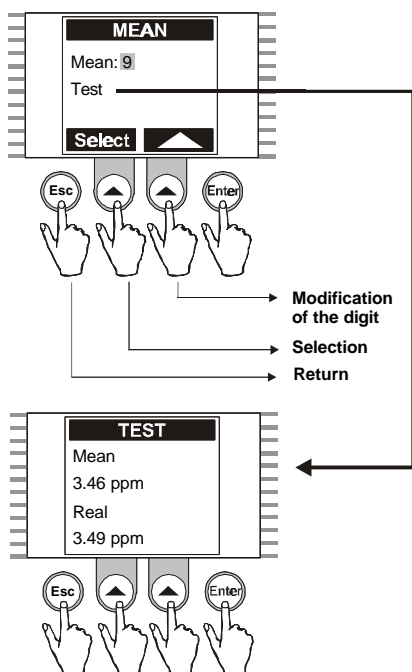
• Programming - RS485 menu



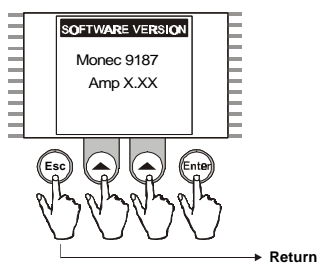
In case of the RS485 option, programme the parameters of the menu below. The optional RS485 board allows you to connect the analyser to a digital communication system. The communication protocol used is MODBUS/JBUS. See the “JBUS/MODBUS” instructions (reference 621=991=000) for more details and to appendix 4 for the list of addresses.

RS485		
N°	XX	Monec number (0...32)
BAUD	- 300 - 600 - 1200 - 2400 - 4800 - 9600	Transmission speed in bauds
PARIT.	- No - Even - Odd	No parity bit With even parity bit With off parity bit
STOP BIT	- 1 - 2	1 stop bit 2 stop bits

• Programming - Mean



MEAN		Used for programming a sliding mean for concentration measurement
MEAN	X	Number of measurements made for mean calculation
TEST		Used for viewing the difference between a measurement with or without mean

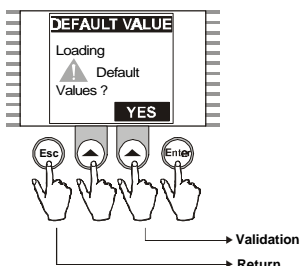


• **Programming - Software Version**

This menu displays the version number of the software installed on the instrument.

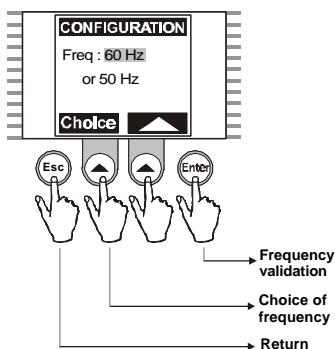
• **Programming – Default value**

If you press Yes, you will reload the default values and will lose any programmed values, along with calibration parameters.



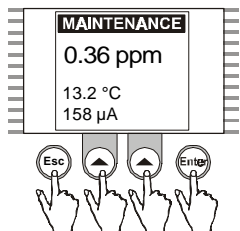
• **Programming - Frequency**

You can set the frequency of the electrical mains using this menu, accessed using the "SELECT" key. Validate using the "Enter" key.



• **Maintenance display**

Menu used for all instrument maintenance operations. The instrument continues to display the measured quantities, but relays 4-20 are frozen.



Warning

You may be required to enter an access code if one has been previously defined. (See CODE menu).

6. Calibration

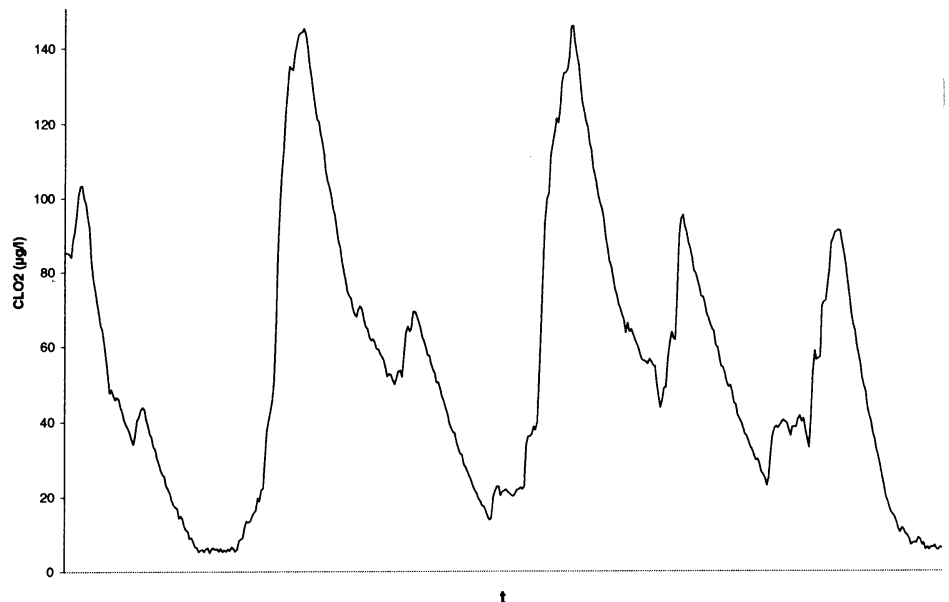
General

Reference method

The recommended reference method is the colorimetric method by discoloration of the amaranth.

Choice of calibration values

In the case of a process having significant variations of concentration in ClO_2 , for example a water tower (filling cycles): the calibration point should be found in the upper values rather than in the lower values to obtain the maximum precision of the apparatus.



Moreover, the imprecision associated with the reference measurement will also be amplified.

Reminder

See chapter 6 for details of command programming.

REMARK:

All results (calibration or measurements) are always brought back to the reference temperature (25 °C, 77 °F). If the sample's temperature is different to the reference temperature, temperature compensation must be performed, which can be automatic or manual.

Calibrating the temperature sensor

The temperature probe is found in the chlorine dioxide probe. It is factory pre-set and requires on-site calibration in the sample. This calibration must be performed prior to calibration of chlorine dioxide measurement.

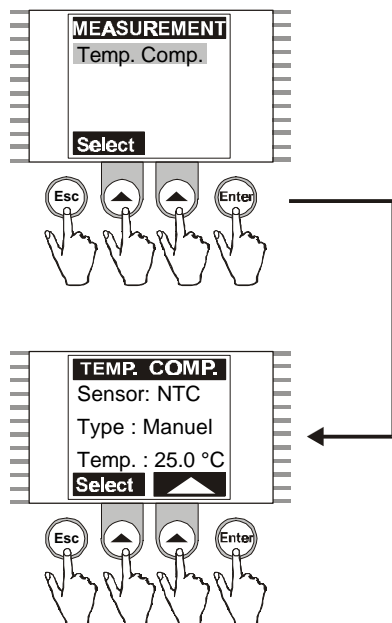
Automatic temperature compensation

The sensor permanently measured the sample's temperature. Concentration values are automatically brought back to a reference temperature (25°C) by means of an algorithm programmed into the transmitter.


The procedure to follow is as follows:

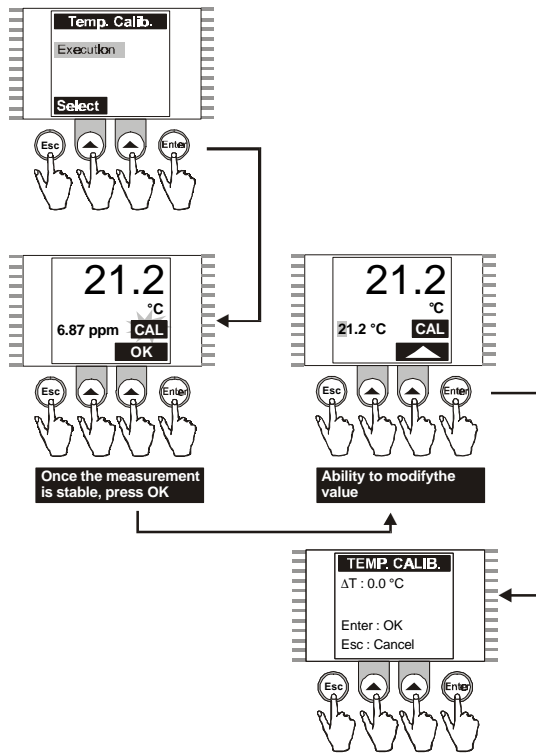
- **Program**

Select **automatic** temperature compensation.



Select the digit to alter using the "SELECT" key then change it with the key

Validate with the "Enter" key 



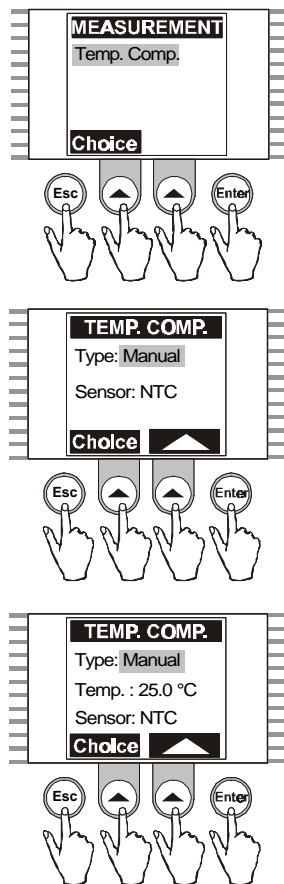
• **Execution**

Execution is triggered from the CALIBRATION menu.

Enter the value of the sample's temperature in °C.

Press OK to adjust the displayed temperature to the actual value of the sample, measured with a high precision thermometer.

The deviation between the calibration and the sensor's theoretical response curve is given for information purposes.



• **Manual temperature compensation**

Select **manual** temperature compensation using the key

Enter a value for the sample's temperature using the key after having selected "Temp. : " with the "SELECT" key.

- **Execution**

There is no execution in manual compensation.

Measurement calibration


Slope calibration is performed by comparison with a laboratory measurement, with the chemical zero, or with the electrical zero.

Electrical zero calibration

- **Programming**

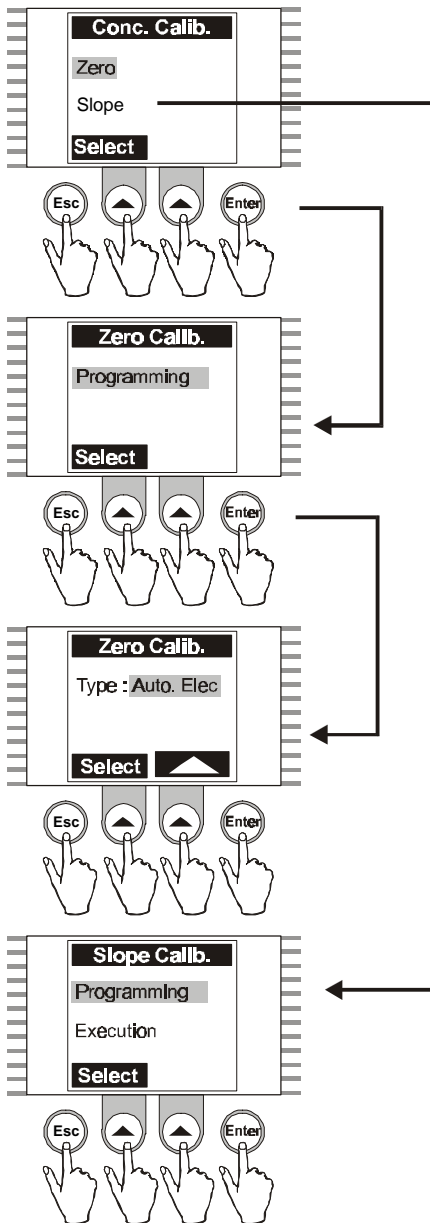
Choice of slope or electrical zero calibration using the "SELECT" key, then validation with the "Enter" key.

Setting validation with the "Enter" key, to access the calibration type selection screen.

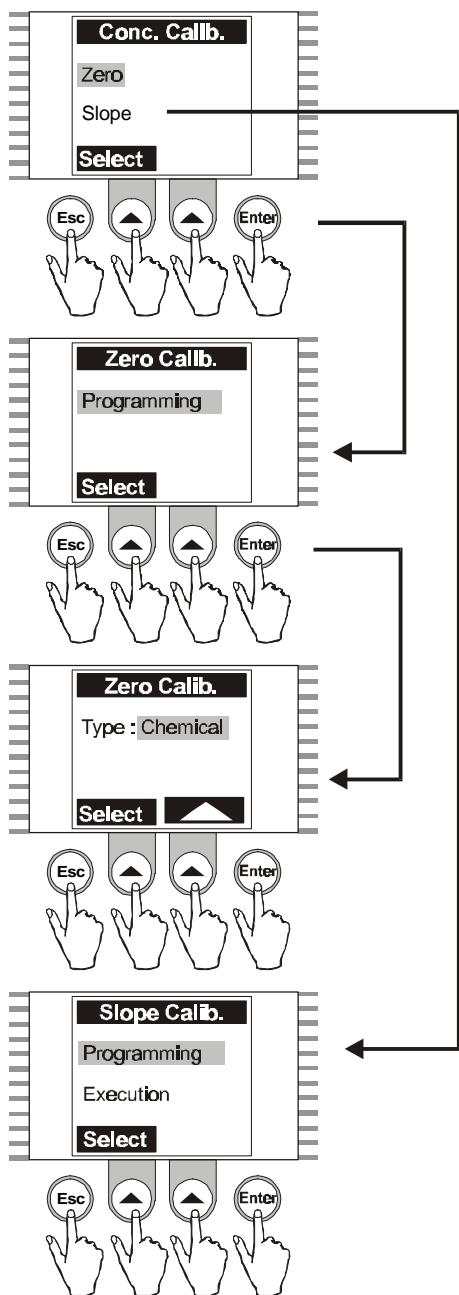
Choice of type of zero calibration using the key  : "Auto-Elec", then validation return using the "Enter" key and return with the "Esc" key.

Selection between "Programming" and "Execution" with the "SELECT" key, then validation with the "Enter" key.

The analyser will automatically compensate, at a regular frequency, for any electronic drift.



Chemical zero calibration



- Programming**

Zero is obtained with the help of a sample of water free from chlorine dioxide. Ensure that there is sufficient flow rate or mixing.

Choice of chemical zero: in the CALIBRATION menu, select CONC. CALIBRATION. Choice of slope or electrical zero calibration using the "SELECT" key, then validation with the "Enter" key.

Validate settings with the "Enter" key to return to the calibration type selection screen.

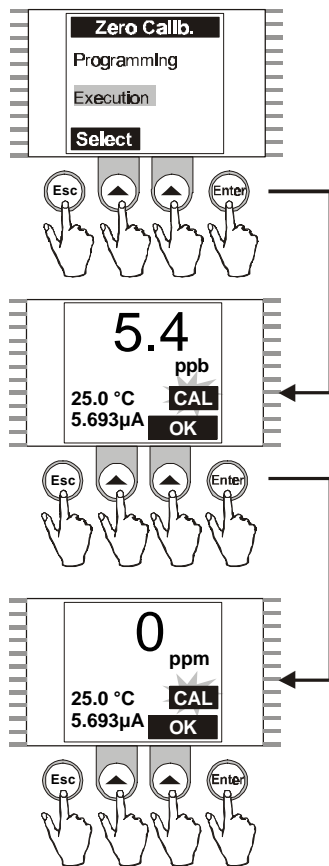
Choice of type of zero calibration using the key



: "Chemical", then return

Validate using the "Enter" key and return with the "Esc" key.

Selection between "Programming" and "Execution" using the "SELECT" key, then validation with the "Enter" key.



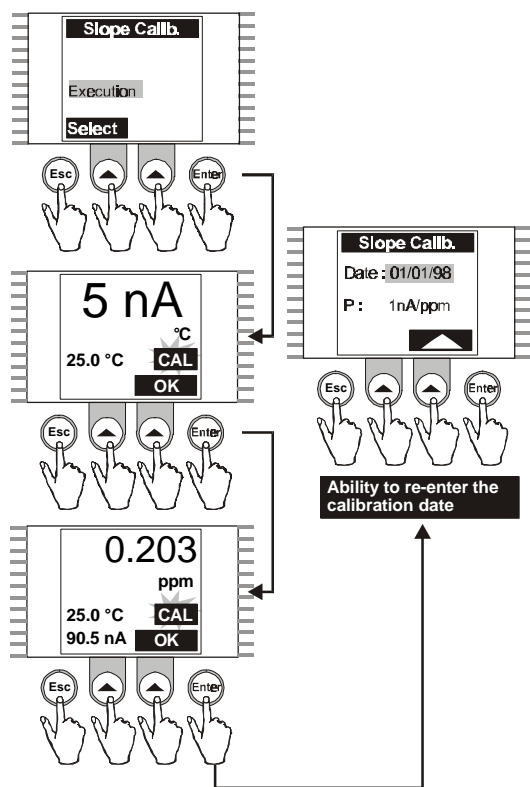
• Execution

Execution of the chemical zero. The CAL message flashes, indicating that the instrument is in calibration mode. Wait for **current stabilisation** and press "OK". The instrument displays the zero for a few seconds, then returns to the previous level.

Calibrating the slope: proceed as stated in Slope + electrical zero calibration.


Remark:
 Calibration can be interrupted at any time by pressing ESC. The instrument will then retain the parameters of the previous calibration.

Slope calibration



- Execution

From the CALIBRATION menu, select CALIBRATION, followed by CONC. and SLOPE. The CAL message flashes, indicating that the instrument is in calibration mode. Wait for **current stabilisation** and press "OK", then immediately take a sample for reference analysis.

Adjust the value of the concentration in chlorine dioxide digit by digit with the help of the function key  to the reference value obtained by a standardised method.

To note : this key makes it possible to select the unit (ppb/ppm).

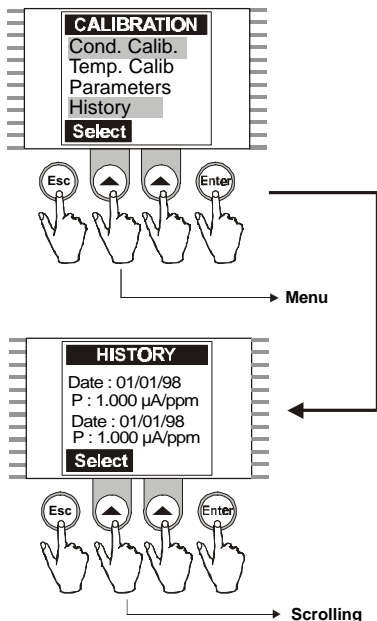
The analyser then displays the date of the last calibration, along with the calculated slope. Alter the date if necessary.

NOTE

We strongly recommend collecting the sample for reference analysis from the analyser outlet. Indeed, a significant proportion of the ozone is consumed during passage through the measurement cell.

• History

Accessible from "Menu", then "Calibration"



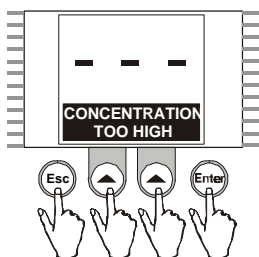
PARAMETERS		
DATE	xx/xx/xx	Date of the last calibration. The programmed date is not automatically updated.
P	x.xxx ∞A/ppm	Slope value
ZERO	x.xxx nA	offset value
ΔT	x.x °C	Deviation between theoretical temperature (sensor curve) T_h and measured temperature T_m : $\Delta T = T_h - T_m$
HISTORY		
DATE	xx/xx/xx	Date of calibration n-1
P	x.xxx nA/ppm	Value of slope n-1
DATE	xx/xx/xx	Date of calibration n-2
P	x.xxx nA/ppm	Value of slope n-2

7. Processing anomalies

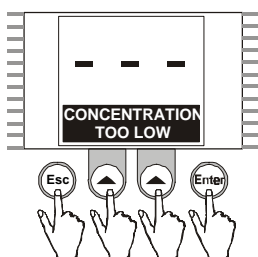
Remark:

If an error occurs, the measurements are replaced by dashes “- - -”.

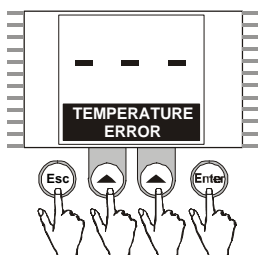
Measurement-related error messages



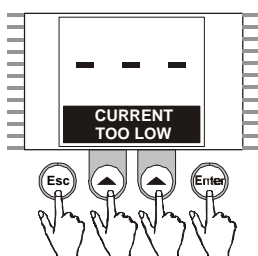
Positive measurement range overflow. Check the current value, along with the calibration parameters.



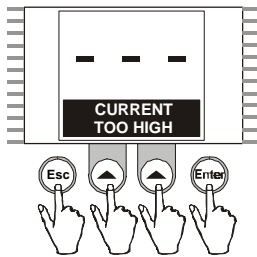
Negative measurement range overflow. Check the current value, along with the calibration parameters.



Sample temperature range overflow. Check for short-circuit or open circuit.

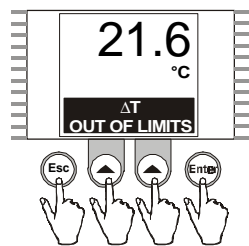


Measurement range overflow (negative current). Check the electrode (electrolyte and membrane).



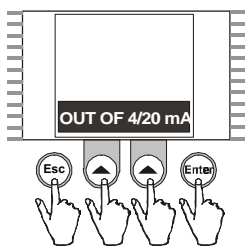
Measurement range overflow. Ensure that there are no short-circuits on the measurement chain. Check the polarising voltage.

Calibration-related error messages

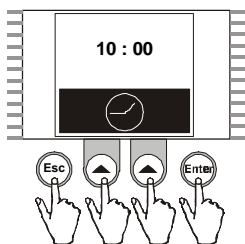


The temperature difference between calibration and the theoretical sensor response is greater than the authorised limit.

Limits: ± 20 °C.



The "Out of 4/20 mA" error message is displayed when the measured value is out of the programmed scale start and end range for analogue outputs 1 and 2 (PROGRAMMING / mA OUTPUTS / OUTPUT 1 or 2).



When the S4 relay is used as a Timer, a countdown is displayed for the start of the relay execution cycle. This countdown is expressed in hours : minutes, with the exception of the last ten minutes, where it is expressed in hours : minutes : seconds.

8. Start-up, cleaning and maintenance

WARNING !

Take all precautions necessary associated with the use and handling of dangerous substances (see ANNEX 8: "Safety data notice").

Start-up

Probe assembly

The probe is made up of the following elements:

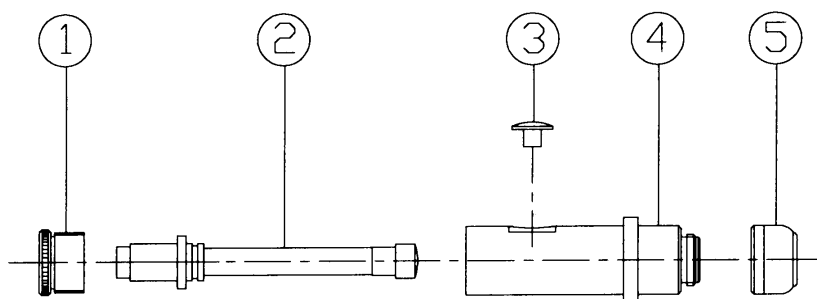


Figure 8.1

- 1 Clamping nut
- 2 Measurement electrode
- 3 Filling cap
- 4 Probe body
- 5 Membrane

To assemble the probe, proceed as follows:

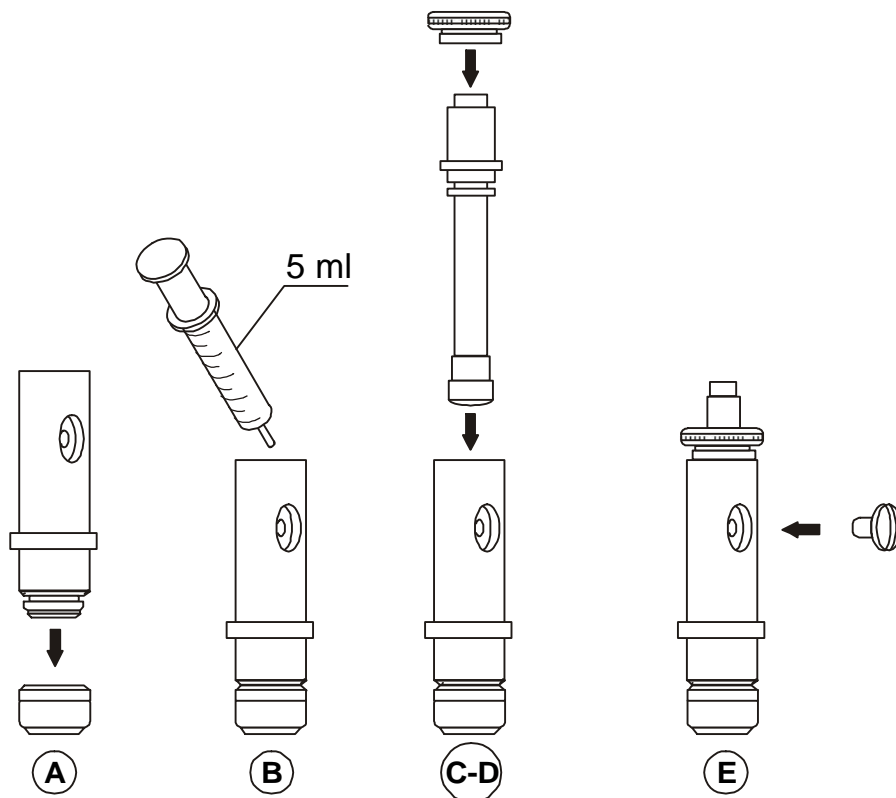


Figure 8.2

- A** - Screw on the membrane, it should push up against the body of the probe.
- B** - Fill with 5ml of electrolyte.
- C-D** - Insert the electrode, screw on the clamping nut.
- E** - Insert the filling screw.

Recommendations:

- Ensure that no air bubbles are trapped when inserting the electrode.
- The membrane must be perfectly screwed on.
- Ensure that no impurities are trapped in the electrolyte.
- The electrode should be inserted slowly, without forcing.

Placing the probe in the cell

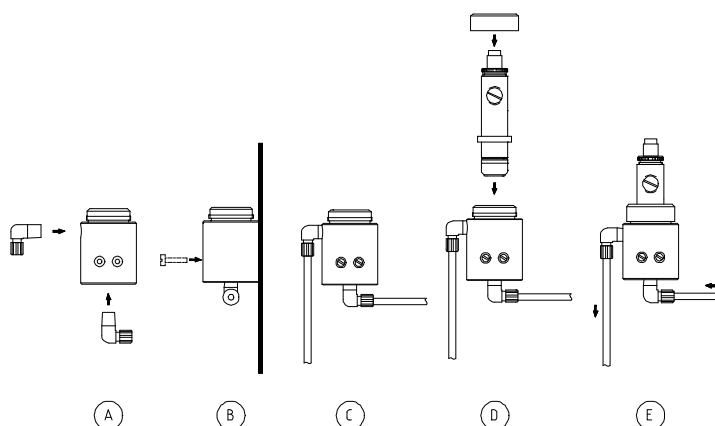


Figure 8.3

- A** - Position the connectors.
- B** - After positioning the connectors, fix the cell (M4 screws, thread length: min. 35 mm).
- C** - Insert the inlet and outlet tubing. The recommended dimensions are:
Inlet tube: \varnothing int./ext.: 4/6
Outlet tube: \varnothing int./ext.: 6/8
Evacuation should be as direct as possible (gravitational).
- D** - Position the probe and block it with the cap.

Filling the instrument

Once the instrument has been installed, it can be filled with water: for this, progressively open the supply valve until the recommended flow rate of 15 l/h is reached.

Stabilisation time

Prior to calibration, you must wait approximately 3 hours for the instrument to stabilise completely.

Connecting the probe

See § 4 for electrical connections. The standard cable length is 10m.

Mains connection

Place the mains supply and transmitter ferrite and connect according to figure 4.1 page 22.

Starting the analyser

The analyser performs an automatic test and displays an initial value. Wait for the measurement to stabilise. You can calibrate the analyser once the temperature and concentration are stable.

NOTE:

The probe contains electrolyte, we recommend that you keep it upside down when removing from water.

Replacing the membrane

Proceed as follows:

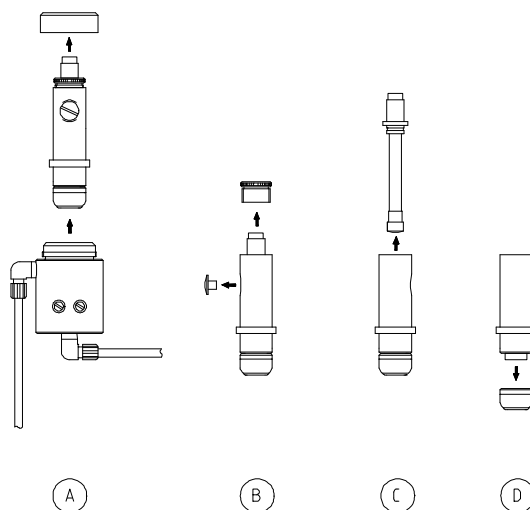


Figure 8.4

Cut off the water supply, remove the probe connector.



Ensure that the alarms generated by this procedure have no effect. If this is not the case, switch to maintenance mode before the operation.

- A** - Unscrew the cell cap, remove the sensor.
- B** - Unscrew the electrode cap and filling cap.
- C** - Remove the electrode, pour off the electrolyte.
- D** - Unscrew the worn membrane, replace it with a new one.

For re-assembly, proceed in reverse order (c.f. electrode assembly), taking care not to trap any air bubbles when inserting the electrode.

Recommendations:

- Never pull sharply on the electrode when the filling screw is in place.
- Avoid touching the active part of the membrane.
- Do not re-use a worn membrane.
- When inserting the electrode, pre-position it without forcing; this latter should position itself by simple gravitational effect.
- The change of membrane should be accompanied by a stabilisation time of around 1 hour, followed by a calibration.
- The membrane should be screwed as far as the mechanical stop.

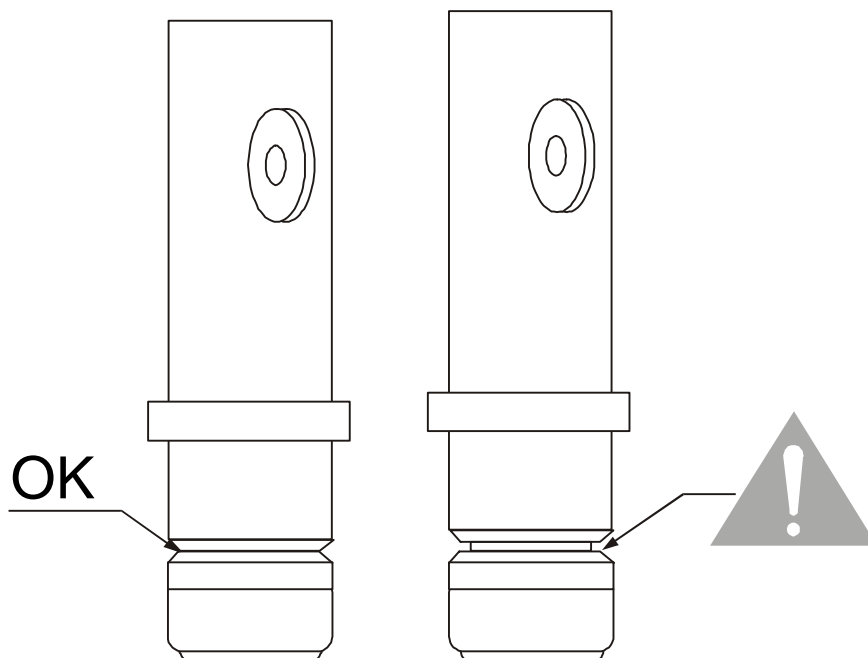


Figure 8.5

Detection of functional faults

High instability in measurement mode	
CAUSES	SOLUTIONS
- There is water in the probe connector	- Dry the connector and check that it is correctly screwed on
- Poor connection	- Check the transmitter to probe connections
- High degree of electromagnetic disturbance near the cable, probe or transmitter	- Find a better position for the cable and check the EMC level
- Bubbles in the sample	- Check the sample supply line
- Output too low ≤ 10 l/h	- Increase the sample output (12 - 15 l/h recommended)
- Temporary interference with other elements	- Generally O ₃

Lack of precision	
CAUSES	SOLUTIONS
- Membrane permeability has been altered (fouling)	- Calibrate the analyser and check that concentration has returned to normal. In the event of important carbonate deposits (high iron or manganese °TH), the use of the acidification kit (c.f. options) may be required.
- Instrument drift	- Initial calibration was performed before the instrument had stabilised: → re-calibrate the instrument
- Abrupt measurement shift	- Bubbles in the sensor → dismantle the electrode
- Error during calibration or poor calibration (see above)	- Repeat the calibration to check the parameters. If the error is confirmed, check the calibration current (too high, too low, or unstable)
- The temperature has not been calibrated	- Check the temperature displayed by the Monec and calibrate it (see pages 42-43). If manual compensation was selected, check that the value entered was correct
- Flow rate too low (12 - 15 l/h recommended)	- Check the sample supply circuit
- Leak at the membrane	- Check for the presence of electrolyte Change the membrane.

- Temperature or pressure are out of specifications	- Change the position of the probe or change the sample such that it falls within the specifications
- The potential is not at + 100 mV	- Enter the correct value
- The membrane is poorly screwed on	- Screw the membrane on correctly

Miscellaneous problems		
PROBLEM	POSSIBLE CAUSE	SOLUTION
- Probe current is null during measurement	- Electrolyte leak: there is no more electrolyte in the probe	- Change the membrane - To tighten correctly - To fill of new electrolyte
- Probe current is negative	- Anode circuit connection problem (intermittent contact) - leakage of electrolyte at the membrane - Inappropriate electrolyte	- Ensure good connection with the anode circuit - Change the membrane - Replace the electrolyte for the specific chlorine dioxide electrolyte
- Sample temperature does not fit the specifications	- There may be a short-circuit in the temperature connection - Error may have occurred during temperature calibration	- Ensure good connection with the temperature circuit - Carry out a new calibration
- The displayed concentration drops abnormally	- The membrane is soot - The membrane is perforated - Not enough output	- Change the membrane and renew the electrolyte - Change the membrane and renew the electrolyte - Increase the output (12 - 15 l/h)

Detection of electrical faults



WARNING !

Never open the instrument before unplugging it

PROBLEM	SYMPTOM	SOLUTION
No display	No power Poorly connected instrument	Check the mains and the connection
	Faulty fuse	Check the fuse
	The instrument's mains voltage is incorrect	Check the voltage terminals
	The cable connecting the mains board to the CPU board is poorly connected	Check that the terminal strips are connected
	Incorrect connection between the CPU board and measurement module	Check connections
	Short-circuit in the mains board	Visually inspect the mains board
	Faulty hardware	Call the technical department
The display shows undefined characters	Poor CPU board or processor operation	Using the instruction manual, program the instrument to load the default values
	CPU board hardware	Re-initialise by switching of the instrument for 5 to 10 seconds. Call the technical department
The keyboard doesn't work; the keys are inactive	Poor CPU board operation, external interference	If there is no response, reinitialise the instrument by switching it off for 5 to 10 seconds. Check the keys once more. If there is no change, call the technical department

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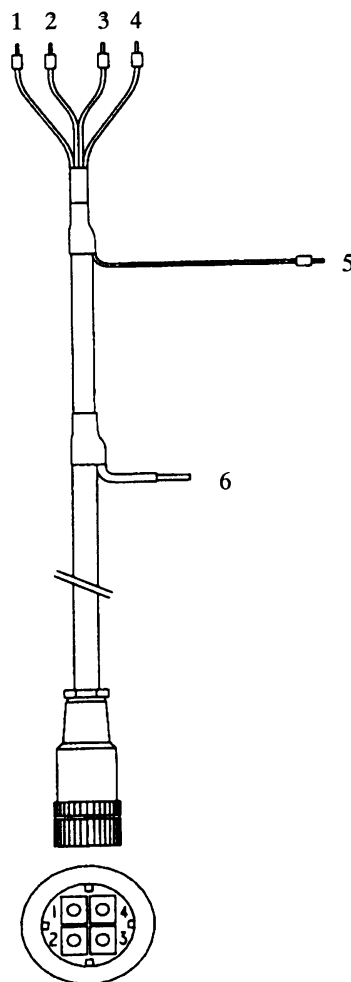
Incorrect measurement	The instrument has not been correctly programmed	Check the program parameters. Do they match the probe properties?
	System, including the probe, in correctly programmed	Calibrate the whole system (probe connected)
	Probe poorly connected	Check all probe connections
	Probe functions poorly, may be incompatible with the application	Check probe condition visually. Does the application match the probe's specifications?
	Faulty CPU board	If the error persists, call the technical department
Unstable measurement	Faulty probe	Check probe condition. Is it fouled?
	Probe poorly connected	Check that the probe is properly connected
	Interference	Check that there is no external source of chemical, temperature or pressure interference
	Poorly connected cable shielding	Check and connect
	Faulty CPU board	If the problems persist, call the technical department
Incorrect temperature measurement	Poorly connected probe	Is the probe properly connected? Check
	Temperature not calibrated	Calibrate temperature
	Faulty CPU board	If the problems persist, call the technical department

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Read-out is blocked and cannot be altered	Faulty CPU board and/or another piece of transmitter hardware	Check that the probe is properly connected
		Reinitialise
		Reprogram the instrument
		if the problem persists, perform a reset: cut the power for 5 to 10 seconds
		If problems persist, call the technical department
The alarm relays do not trigger	The instrument has not been correctly programmed	Check that the relay parameters have been programmed
	Faulty hardware	Check that the alarm thresholds are compatible
		Check relay properties with an ohmmeter
		If problems persist, call the technical department
Poor output current, the output current remains at 0 or 20 mA	Poorly programmed instrument	Check the output current parameters
	Poor or faulty MONEC connection with peripheral devices	Check the cables
	Faulty hardware	Compare the measured value with the output current measurement
		If problems persist, call the technical department
The polarising voltage is incorrect	Poor configuration (3-electrode mode)	Check that the terminals under the conductimetric board are in the ON position
	Poor programming	

APPENDIX 1

Cable connection details



VUE INTERNE CONNECTEUR
INTERNAL VIEW OF CONNECTOR

Mark	Colour	Function	Connector mark
1	Black	T +	1
2	blue	T -	2
3	White	Work (orange tip)	3
4	Red	Counter	4
5	White	GND (blue tip)	5
6	White	Earth (blue tip)	6

APPENDIX 2

Accessories and options

Standard 9180 transmitter	09180=A=0100
24 V 9180 transmitter	09180=A=0120
9180 NEMA 4x transmitter	09180=A=3100
Eprom ClO ₂	09180=A=6200
Conductimetric board	09180=A=1501
Relay board	09125=A=4000
Microchip board	09125=A=1000
10m probe cable	09180=A=8010
Electrode	09185=A=1000
Probe body	09078=C=1010
Filling screw	09078=C=1030
Sealing washer	09078=C=1020
Probe nut	08878=A=1020
Membrane box	09078=A=3500
Bottle of electrolyte	09185=A=3600
Set of 1/4" NPT PN 4/6-6/8 connectors	09184=A=4510
Cell	09181=C=4500

Accessories and options (cont'd)

Mounting plate	09184=C=2700
Standard overflow pot	09185=A=1700
Control valve	696=046=001
220V 50/60Hz chemical cleaning kit	09185=A=7100
110V 50/60Hz chemical cleaning kit	09185=A=7110
24V 50/60Hz chemical cleaning kit	09185=A=7124
Overflow vessel for chemical cleaning kit	09185=A=1800
Chemical cleaning 220 V 50/60 Hz	09184=A=2500
Chemical cleaning 110 V 50/60 Hz	09184=A=2510
Chemical cleaning 24 V 50/60 Hz	09184=A=2524
Set of 5 spare tubes for chemical cleaning pump	590=514=200
Technical instructions French	621=091=087
Technical instructions English	621=191=087
Technical instructions German	621=291=087
Technical instructions Spanish	621=591=087
Technical instructions Italian	621=491=087

APPENDIX 3

Temperature conversion table

Conversion from °C to °F : °F = 1.8 x °C + 32

Conversion from °C to °K : °K = °C + 273.15

°C	°F	°K	°C	°F	°K
0	32	273.15	24	75.2	297.15
1	33.8	274.15	25	77	298.15
2	35.6	275.15	26	78.8	299.15
3	37.4	276.15	27	80.6	300.15
4	39.2	277.15	28	82.4	301.15
5	41	278.15	29	84.2	302.15
6	42.8	279.15	30	86	303.15
7	44.6	280.15	31	87.8	304.15
8	46.4	281.15	32	89.6	305.15
9	48.2	282.15	33	91.4	306.15
10	50	283.15	34	93.2	307.15
11	51.8	284.15	35	95	308.15
12	53.6	285.15	36	96.8	309.15
13	55.4	286.15	37	98.6	310.15
14	57.2	287.15	38	100.4	311.15
15	59	288.15	39	102.2	312.15
16	60.8	289.15	40	104	313.15
17	62.6	290.15	41	105.8	314.15
18	64.4	291.15	42	107.6	315.15
19	66.2	292.15	43	109.4	316.15
20	68	293.15	44	111.2	317.15
21	69.8	294.15	45	113	318.15
22	71.6	295.15			
23	73.4	296.15			

APPENDIX 4

RS485 MODBUS-JBUS addressing

CALIBRATION MENU		
/ CONC. CALIBRATION		
/ZERO		
/PROGRAMMING		
/Type	(0:AutoElec. 1: Chem.)	0121
/EXECUTION		
/SLOPE		
/PROGRAMMING		
/Type	(0:Process)	0221
/P		0222
/Tamb		0223
/EXECUTION		
/TEMP. CALIBRATION		
/EXECUTION		
/PARAMETERS		
MEASUREMENT MENU		
/ TEMP. COMP.		
/Type	(0 : Manual. 1 : Auto)	1220
/Temp.		1230
ALARMS MENU		
/ALARM1		
/Assign.	(0:conc. 1:°C/°F. 2:No)	2120
/Threshold		2130
/Direction	(0:Down. 1:Up)	2140
/tempo.		2150
/hyst.		2160
/Relays	(0:N.O.. 1:N.F.)	2170
/ALARM2		
/Assign	(0:conc. 1:°C/°F. 2:No)	2220
/Threshold		2230
/Direction	(0:Down. 1:Up)	2240
/tempo.		2250
/hyst.		2260
/Relays	(0:N.O.. 1:N.F.)	2270
/ALARM3		
/Mode	(0:Threshold. 1:Syst. 2:No)	2310
/Assign	(0:conc. 1:°C/°F. 2:No)	2320
/Threshold		2330
/Direction	(0:Down. 1:Up)	2340
/Temp.		2350
/Hyst.		2360
/Relays	(0:N.O.. 1:N.F.)	2370
Acquit	(0:Man. 1:Auto)	2380

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/ALARM4		
/Mode	(0:Threshold. 1:Timer. 2:No)	2410
/Assign	(0:conc. 1:°C/°F. 2:No)	2420
/Threshold		2430
/Direction	(0:Down. 1:Up)	2440
/Tempo.		2450
/Hyst.		2460
/Relays	(0:N.O.. 1:N.F.)	2470
/Interv.		2401
/Nb impul.		2402
/Ton		2403
/Toff		2404
/TmA		2405
OUTPUTS MENU mA		
/OUTPUT1		
/Assign	(0:∞A. 1:°C/°F. 2:conc.)	4110
/Type	(0:0/20mA. 1:4/20mA)	4120
/Mode	(0:lin. 1:bi-lin)	4150
/Start		4130
/Middle		4160
/End		4140
/OUTPUT2		
/Assign	(0:∞A. 1:°C/°F. 2:conc.)	4210
/Type	(0:0/20mA. 1:4/20mA)	4220
/Mode	(0:lin. 1:bi-lin)	4250
/Start		4230
/Middle		4260
/End		4240
/ SPECIAL PROG.		
/MAINTENANCE		
/Mode	(0:Live. 1:Memo. 2:Return)	4311
/Value		4312
/CALIBRATION		
/Mode	(0:Live. 1:Memo. 2:Return)	4321
/Value		4322
/ALARM SYST.		
/Mode	(0:Live. 1:Memo. 2:Return)	4331
/Value		4332
/TIMER		
/Mode	(0:Live. 1:Memo. 2:Return)	4341
/Value		4342
/TEST		
RS485 MENU		
/N°		5100
/Baud	(0:300. 1:600. 2:1200. 3:2400.	5200
/Parity	4:4800. 5:9600)	5300
/ Stop bit	(0:No. 1:;Odd. 2:Even)	5400
	(0:1bi. 2:2bits)	

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SERVICE MENU		
/MEAN		
/Mean	(0:0....10:10)	7210
/TEST		
/DISPLAY		
/Conc.	(0:ppb-ppm.1:∞g-mg/l)	7360
/Temp.	(0:°C. 1:°F)	7320
/Language	(0:F. 1:GB. 2:D. 3:Sp. 4:I)	7330
/CODE		
/Control		7410
/Program		7420
/Service		7430
/ SOFT VERSION		
/DEFAULT VAL.		
/mA SETTING		
/OUTPUT1		
OUTPUT2		
/CONFIGURATION		
/Freq	(0:60Hz. 1:50Hz)	7810
Measured values: Adr 0000 : concentration value Adr 0002 : temperature value Adr 0004 : current value Adr 0004 : secondary measured value		

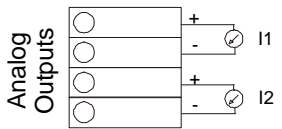
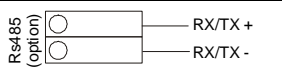
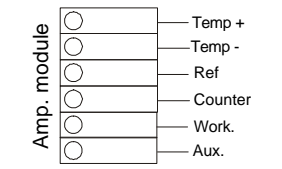
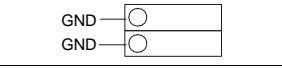
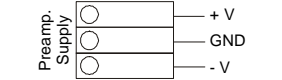

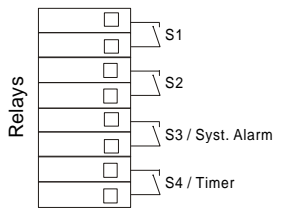
APPENDIX 5

Default values

CALIBRATION	
CONTROL CONC. OFFSET Type : ElecAuto SLOPE Tamb:20.0 °C	PARAMETERS DATE : 01/01/99 XX : NA/ppm ΔT : 0.0°C
PROGRAMMING	
MEASUREMENT	
TEMP. COMP. TYPE : Auto	
ALARMS	
ALARMS4 ASSIGN. :Conc. THRESHOLD :0.00 ppb DIRECTION :Down TEMPO. :000 s HYST. :00% RELAYS :NO	ALARM S3 ASSIGN. :System ACQUIT :Auto RELAYS :NF
MA OUTPUTS	
OUTPUT 1 ASSIGN. :Conc. TYPE :4-20 MODE :Lin. START. :0.00 ppm END :2.000 ppm	OUTPUT 2 ASSIGN. :Conc. TYPE :4-20 MODE :Lin. START. :0.00 ppm END :2.000 ppm
SPECIAL PROG.	
MAINTENANCE MODE : Memo TIMER MODE : Memo	CALIBRATION MODE : Memo SYSTEM ALARM MODE : Memo
RS485	
N° : 0 BAUD : 9600 PARITY : No STOP BIT : 1	
SERVICE	
MEAN	
MEAN : 1	
DISPLAY	
CONC. : ppb/ppm TEMP. : °C LANGUAGE : GB	
CODE	
CONTROL : 0000 PROG.. : 0000 SERVICE : 0000	
CONFIGURATION	
FREQ. : 50Hz	

APPENDIX 6

Description of the various terminal strip functions

insulated 0/4-20 mA outputs galvanic	Description		Wiring
	0-20 mA or 4-20 mA (n° 1) [+]		user
	0-20 mA or 4-20 mA (n° 1) [-]		user
	0-20 mA or 4-20 mA (n° 2) [-]		user
	0-20 mA or 4-20 mA (n° 2) [+]		user
	RS485 option		user
			user
Conductimetric module 	Description	Colour	Wiring
	temperature sensor [+]	black	temp +
	temperature sensor [-]	blue	temp -
	reference if 3 electrodes used	not used	
	counter-electrode (anode)	red	counter
	working electrode (cathode)	white mark 3	work
	auxiliary input		aux.
	External shielding	white mark 6	shielding plate
		white mark 5	GND
	Internal shielding	white mark 5	GND
	Not used for measuring chlorine dioxide	ozone	n.c.
	Main power supply. VAC 90-265 50/60 Hz or 24 V (special AC/DC version)		
	Description	Wiring	
	alarm 1. simple contact	user	
	alarm 2. simple contact	user	
	alarm 3 or alarm. system simple contact	user	
	alarm 4 or timer. contact simple	user	

APPENDIX 7
Electrolyte toxicity sheet for 9187

This solution is not recorded as being dangerous in the European directive 67/548/CEE and its amendments.

APPENDIX 8 SAFETY DATA NOTICE

1. Identification of the substance/préparation and of the company/business

Identification of the substance or the preparation

Product code: 109060
Name of product: Hydrochloric acid c(HCl) = 0.5 mol/l

Supplier identification

Company/business: Polymetron

Regional representation: This information can be found on the safety data notice (SDN) authorised for your country

Emergency telephone number: Please contact the regional representative in your country

2. Composition/information on the components

Aqueous solution

3. Identification of the dangers

Product considered not dangerous by Directive 67/548/CEE

4. First aid

In case of inhalation:	Breathe in fresh air
In case of contact with the skin:	Wash abundantly with water
In case of contact with the eyes:	Rinse abundantly with water on keeping the eyelids open
In case of ingestion:	Drink a lot of water
In case of feeling unwell	Seek medical advice

5. Fire fighting measures

Appropriate extinguishing means
Means adapted for products stored in direct proximity

Specific risks

Non-combustible: risk of formation of hydrogen in case of contact with light metals (danger of explosion)

Special protective equipment

Do not remain in a dangerous zone without a respirator Pack

Additional information

Avoid the penetration of extinguishing water into surface water or ground water

6. Measures to take in case of accidental dispersion

Cleaning / absorption procedure: Recuperate with an absorbent for liquids
Clean up the residues

SAFETY DATA NOTICE (Cont'd)

7. Handling and storage

Handling

Aptitude to unlimited storage

Storage

Hermetically sealed, in a well ventilated place, away from any source of heat or ignition
From +15 °C to +25 °C. These conditions are valid for whole containers.

Requirements concerning storage spaces and containers

No metal containers

8. Controlling individual exposure/protection

Individual protective equipment

Respiratory protection:	necessary in the case of the appearance of vapours/Aerosols
Eye protection:	necessary
Hand protection:	necessary

Choose the means of individual protection in function with the concentration and the quantity of dangerous substances and the place of work. Enquire with the supplier about the chemical resistance of the means of protection.

Hygiene measures

Remove any soiled clothes. Wash hands after work

9. Physical and chemical properties

Form:	liquid	
Colour:	colourless	
Odour:	odourless	
pH:	(20 °C)	1.2
Fusion point	not available	
Boiling point	not available	
Ignition point	not available	
Flash point	not available	
Lower explosive limit	not available	
Upper explosive limit	not available	
Relative vapour density	not available	
Density	(20 °C)	1.00 g/cm ³
Solubility in water	(20 °C)	soluble

SAFETY DATA NOTICE (Cont'd)

10. Stability and reactivity

Conditions to avoid

Heating

Materials to avoid

Metals (formation of hydrogen)
The known reaction partners in water

Dangerous decomposition products

No information available

Other data

Materials, metal alloys

11. Toxicological information

Acute toxicity

We know of no quantitative data concerning the toxicity of this product

Other toxicological information

Expected property because of the constituents of the preparation
Possible effect in case of contact with the substance: slight irritation of the mucous and the eyes

Other data

Handle this product with the usual precautions for a chemical product

12. Ecological information

Ecotoxic effects

We do not have any quantitative data concerning the ecological effects of this product

Other information concerning the ecology

Concerning HCl in general:

Noxious effects on aquatic organisms

Noxious effects through modification of the pH

Biological effects: hydrochloric acid resulting from a chemical reaction: lethal for fish from 25 mg/l.

Leuciscus idus CL₅₀: 862 mg/l (solution IN)

Limit of noxiousness: plants 6 mg/l. Does not provoke biological consumption of oxygen

When handled and used adequately, no ecological problems are to be feared.

SAFETY DATA NOTICE (Cont'd)

13. Information about elimination

Product

There are no uniform rules concerning the elimination of chemical products and their residues within the European Union. Chemical products and their residues should be considered as specific waste. Its elimination is regulated by each member state. We recommend that you contact the competent authorities or the companies specialising in the elimination of waste, which will be able to advise you on the necessary means for eliminating specific waste.

Packaging

Packaging should be disposed of in compliance with current legislation. Contaminated containers should be treated in the same manner as specific waste. In the absence of any specific regulations, non-contaminated containers can be disposed of like domestic waste or recycled.

14. Information concerning transport

Road transport ADR/RID and GGVS/GGVE

Rail/Road	8	Enumeration and letter	5c
ADR/RID class	8	Enumeration and letter	5c
Name of the material	1789 CHLORINE DIOXIDE		

River transport ADN/ADNR Not verified

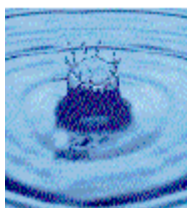
Maritime transport IMDG

IMDG class	8	UNO number: 1789	Packaging group III
Safety sheet	8-03	GSMU : 700	
Official designation	HYDROCHLORIC ACID		

Transport OACI/IATA

OACI/IATA class	8	UNID - No 1789	Packaging group III
Official designation	HYDROCHLORIC ACID		

The instructions concerning transport are cited in compliance with international agreements and in the form used in France. Differences in force in other countries have not been taken into consideration.



Palintest USA

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Leading the Way in Water Analysis

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NEW COLORIMETER MAKES CHLORINE DIOXIDE TESTING FAST AND EASY

More information on the Chlordioxduo meter:

A new dual-range colorimeter for on-the-spot measurement of chlorine dioxide levels in water. This new test is faster and more precise than traditional methods.

The need to measure chlorine dioxide is increasing because it is replacing chlorine as a sterilant and biocide in the process industries. The new Chlordiox Duo instrument is designed for bench use in laboratories and for field use by sampling engineers or contractors. It will accurately measure chlorine dioxide in just one minute and requires no technical knowledge.

Based on well-established test methods, chlorine dioxide is measured within a low or high range: 0-2.5ppm or 2.5-20ppm. After the water sample with a dissolved reagent tablet is inserted in the meter, a single button press produces measurements in parts per million displayed on a 0.5 inch LCD screen. Operating temperature is within the 0-100°F (0-40°C) range.



This meter is specific to chlorine dioxide, effectively avoiding interference from other treatment chemicals like chlorine, chlorites, hydrogen peroxide, manganese or other oxidizing agents.

Powered by two 1.5V batteries, which should last for 20,000 readings, the meter has automatic switch-off. Supplied as a complete test kit including reagents, optional check standards can be used to confirm factory calibration settings.

Product codes:

PT 180 - Chlordioxduo Meter

PT 181 - Chlordioxduo Check Standards with Test Certificate