Operator Manual

POLYMETRON 9125

Conductivity/resistivity measurement

This instrument conforms to the European Directives:

- 89/336/CEE modified by the directive 93/68/CEE
- 73/23/CEE modified by the directive 93/68/CEE

Warning !
There are no user-serviceable parts in either the transmitter or sensor. Only Ultra Analytics personnel or their authorized representative should attempt repair of the system and only components expressly approved by the manufacturer should be used. Any attempt to repair the instrument in contradiction of these guidelines may result in damage to the instrument and injury to the person making the repair. It will also void the warranty and may compromise the safe operation, electrical integrity or CE compliance of the instrument.

Note:
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 the 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.

Precautionary Labels :

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

This symbol, if noted on the instrument, references the instruction manual for operation and / or safety information.

Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 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 Producer for disposal at no charge to the user.

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

Important document. Retain with product records.

Table of contents

1. General presentation of the conductivity / resistivity measure system

Presentation of the 9125 transmitter

The 9125 transmitter and associated measuring sensors has been designed for measuring and continuous control of conductivity and resistivity (with possibility of temperature measurement) in industrial process.

Note :

The programming is displayed in 6 languages. To modify this parameter see § 4 " Display Menu – Choice of the language ".

Introduction

The 9125 transmitter is a user-friendly instrument (installation, programming), equipped with a microprocessor it can be configured to correspond to any application in the following sectors :

- drinking water,
- waste water,
- process (chemistry, paper mills, sugar mills...),
- measurement in pure/ultrapure water (energy power plants, semiconductor industry, chemistry).

The 9125 transmitter should be connected to a probe via a cable.

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.

Conductivity is the capacity a solution has to conduct 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.

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 resitivity (characteristic of the material) :

$$R = r . 1/K$$

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

Characteristics

The 9125 is equipped with an input measurement channel : a conductivity probe, 2 electrodes and inductive may be connected as well as a temperature Pt100 or Pt1000 probe.

The 9125 is also equipped with 2 analogue outputs (0 or 4-20 mA).

Options available on request

- board with 4 relays
- RS485 board

MAIN SPECIFICATIONS	
Package	Delivered with instruction manual, 4 cable glands and 2 mounting screws and a specifications conformed certificate
Maintenance	No particular maintenance required. Clean the instrument with a soft tissue and without any aggressive agent
OPERATING CONDITIONS	
Ambient temperature	-20°C...+60°C
Relative humidity	10...90%
Power supply voltage fluctuation	± 10 %
Over voltage category	2
Pollution degree	2 (as CEI 664)
Altitude	< 2000 m
Measurement category	I (overvoltage less than 1500 V)
ELECTRIC CHARACTERISTICS	
Power supply voltage	• Standard version (± 10 **%**) : - 100 V ... 240 VAC 50/60 Hz • Low voltage version: - 13...30 VAC 50/60 Hz - 18...42 VDC

Connections	2,5 mm^2 screw terminals	
Fuse	5 x 20 mm Cartridge T2AL - 250 V	
Consumption	25 VA	
European standards	EN 61326-1997 and EN61326 A1-1998 (Industrial level for immunity) EN- 61010-1	
UL and CSA agreement	File E226594	
MECHANICAL CHARACTERISTICS		
Dimensions	144 x 144 x 150 mm	
Weight	2 Kg	
Material	Housing : Polyester coated aluminium Screws : stainless steel	
Tightness	IP65	
Mounting types	Wall Pipe Panel	
Cable glands	2 x PG13.5 2 x PG11	
PERFORMANCE		
2 electrode probe	Cell constant 0,01 cm^{-1} 0,1 cm^{-1} 1 cm^{-1}	Conductivity range 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 0,01 cm^{-1} 0,1 cm^{-1} 1 cm^{-1}	Resistivity range 5 kΩ.cm...100 MΩ.cm 0,5 kΩ.cm...10 MΩ.cm 50 Ω.cm...1 MΩ.cm
Inductive probe	Cell constant 1 cm^{-1} 2,35 cm^{-1} 10 cm^{-1}	Conductivity range 100 µS/cm...1 S/cm 200 µS/cm...2 S/cm 1 mS/cm...10 S/cm

Inductive probe	Cell constant 1 cm^{-1} 2,35 cm^{-1} 10 cm^{-1}	Resistivity range 1Ω.cm...10 kΩ.cm 0,5 Ω.cm...5 kΩ.cm 0,1 Ω.cm...1 kΩ.cm
Ambient temperature range	-20°C...+200°C (-4…392 °F)	
Display resolution	Conductivity/resistivity : automatic point drift (min. resolution 0.001 µS/cm) < 0.1 °C	
Accuracy	Inductive : K=1 : ± 2% of the displayed value or ± 0,002 mS K=2,35 : ± 2% of the displayed value or ± 0,004 mS K=10 : ± 2% of the displayed value or ± 0,02 mS 2 electrode : ± 1% of the displayed value temperature < ± 0.4 °C	
Temperature sensor	Pt 100 / Pt 1000	
Temperature compensation	- No - Automatic - Manual	
Automatic temperature compensation range	-20 ... 200 °C -4 ... 392 °F	
Temperature compensation range	Linear Non linear : - ultrapure water, HCl and NaCl	
Sensor types	- 2 electrode sensor - Inductive sensor	
Cable length	100 m maximum	
CALIBRATION		
Conductivity calibration type	- Electric - 2 points - 1 point	
Slope matching	50 ... 150 %	

Temperature calibration	± 20 °C (± 36 °F)

ANALOGUE OUTPUT	
Output signals	2 galvanicly outputs insulated
Allocation	Conductivity/resistivity/temperature
Type	0 ... 20 mA 4 ... 20 mA
Mode	Linear Dual Logarithmic
Maximum load	800 Ω
Accuracy	0.1 mA

ALARMS	
Alarm number	4
Function	- Standard limits - Limits according to USP standard - Alarm system - Timer
Hysteresis	0 ... 10%
Temporisation	0 ... 999 s
Breaking power (resistive load)	250 V AC, 3A max 100 V DC, 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.

RS485	
Baud rate	300 ... 19200 bauds
Insulation	Galvanic
Station number	32 max

PROGRAMMING	
Language	French English German Italian Spanish Dutch
Display	Icones + graphic zone (80*64 pixels)
Protection codes	Calibration Programming Service

2. Installation of the transmitter

Unpacking of the transmitter 9125

Inspect the package at the reception to detect an eventual damage due to the transport. Make sure the package contents are not damaged.

Check if the package corresponds to your order :

- quantity delivered,
- type of instrument and version accordingly to the instruction plates,
- accessories : 4 cable glands and 2 mounting screws + flanges,
- instruction manual,
- certificate of conformity to specifications.

Advice for installation

Choose a site where :

- vibrations are not too excessive,
- supply relays or commuters are away,
- maintenance will be easy.

Note :

Information : It is preferable to mount the instrument above eye level, allowing an unrestricted view of the front panel displays and controls.

Dimensions

(Dimensions are in mm [inches]).

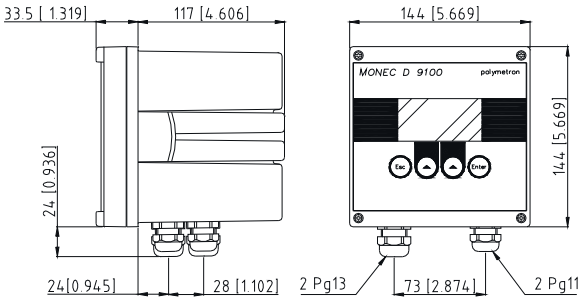


Fig. 2.1 Transmitter 9125 dimension

Mounting types

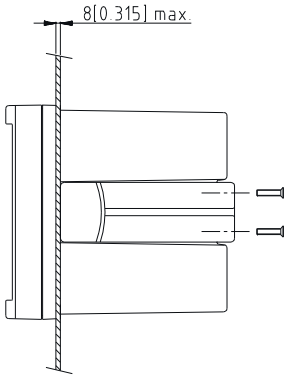
3 possibilities to mount the instrument (use of the red clamping bow) :
The transmitter housing conforms to norm DIN 43700.

Panel mounting :

Panel cutting : 138 x 138 mm
Front panel dimensions : 144 x 144 mm

- **2 screws ∅ 4 mm lg 16 flat head (provided) for panel thickness 0 to 4 mm**
- **2 screws ∅ 4 mm lg 20 flat head (provided) for panel thickness 4 to 8 mm**

Fig 2.2 Panel mounting

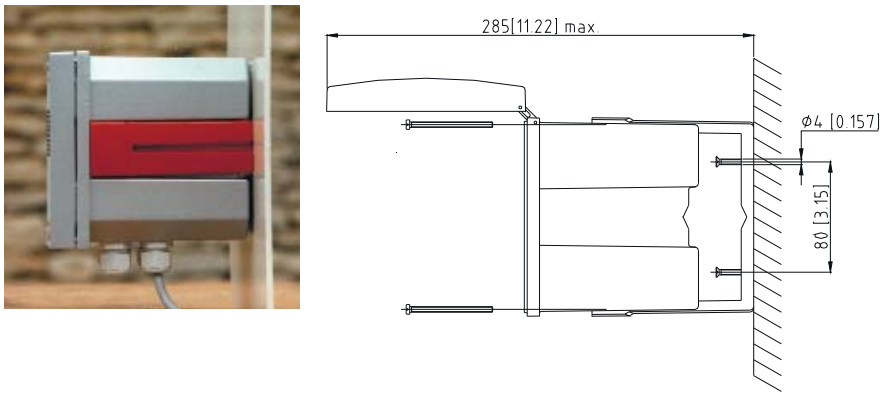


Panel cutting	138 x 138 mm (5.4 in. x 5.4 in.)
Front panel dimensions	144 x 144 mm (5.8 in. x 5.8 in.)
Thickness panel	Inferior to 8 mm

<u>Wall mounting</u> :

- **2 screws ∅ 4 mm lg 60 flat head (not provided)/ 80 mm center distance**

Fig. 2.3 Wall mounting



<u>Pipe mounting</u> :

- **∅ 2" maximum - 2 screws ∅ 4 mm lg 60 (provided)**

Fig. 2.4 Vertical mounting

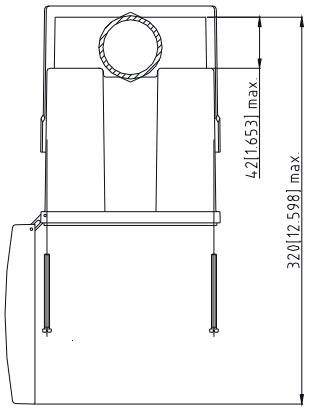
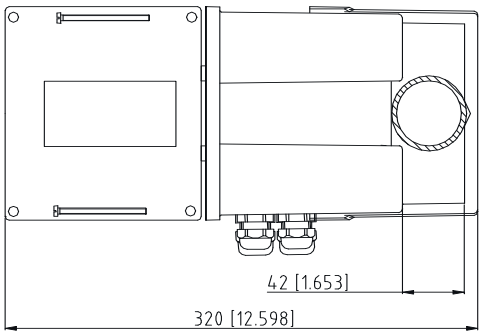


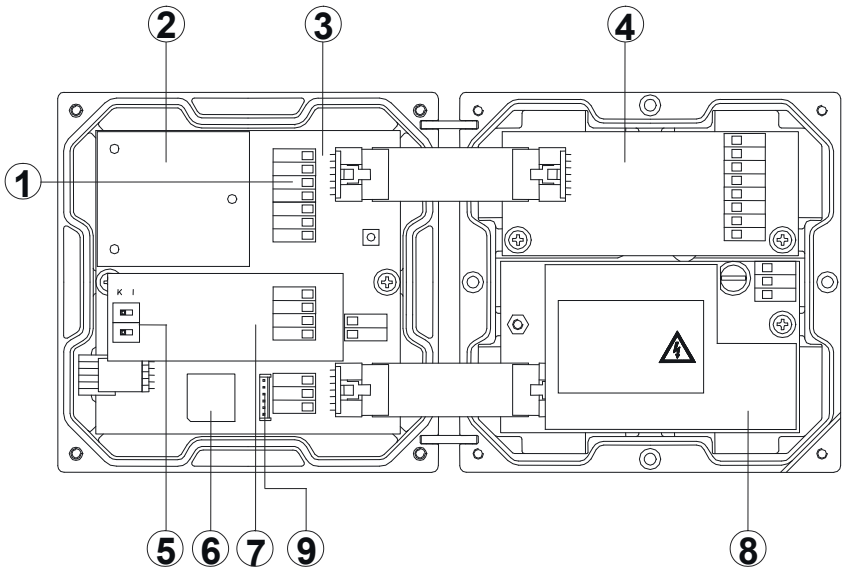
Fig. 2.5 Horizontal mounting



3. Electric connections

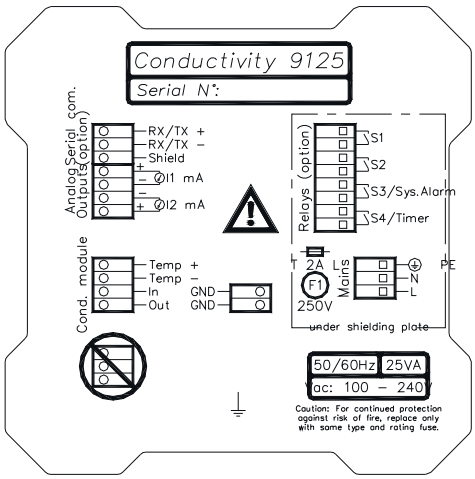
Electronic board lay-out in the 9125 transmitter enclosure

Fig. 3.1 Electronic board lay-out



1. Terminal block 4-20 mA
2. CPU board
3. RS485 board (option)
4. Relay board (option)
5. Choice between an inductive (all 4 switches on position I) or a 2 electrode (Kohlraush) probe (all 4 switches on position K)
6. Programmed EEPROM
7. Conductivity module
8. Power supply board
9. Program update connector

Fig. 3.2 9125 shielded plate

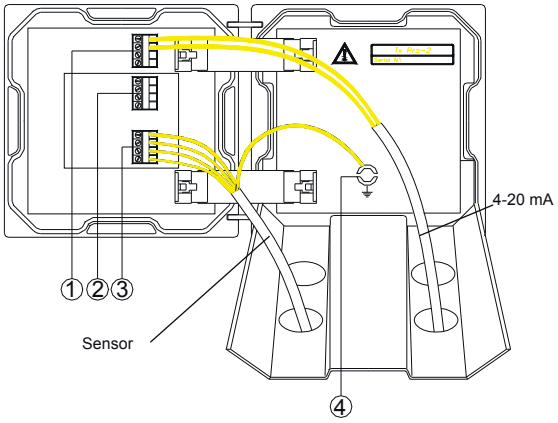


Electric connections are realised on the terminal inside the housing. Put the cables into the appropriated openings.

- The main supply and relay cables should be dispatched via the openings behind the shielded plate. To remove the plate, unscrew the fixing screw on the left side of the plate.
- Sensor and mA output cables should be dispatched via the openings provided on top of the shielded plate.
- Check the creeping of the cables when opening the transmitter.
- It is required to use shielded cables. The shielding should be connected to the earth central shielding.

Fig. 3.3 Power and relays connections

1. Terminal block connections Analogue outputs 4-20 mA
2. Terminal block connections "option RS 485"
3. Terminal block connections of the conductivity sensors
4. Earth



Main connection

Electrical connection should be performed only by qualified personnel. For the base model, the power supply accepts 100-240 VAC ± 10 %, (50/60 Hz) without changes in configuration. Before switching the transmitter, make sure the site voltage corresponds to the instrument voltage indicated on the identification plate. The terminal block for power connections can be lifted from its header for easier installation.

For safety reasons, it is required to observe the precautions below :

- Use a three wire mains supply cable (2 core + PE) with a cross section between 0.35 and 2 mm² (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 power supply by means of a breaker located close to the instrument and be identified. The supply shall be fitted with an overcurrent protection device rated at 20 Amp maximum.
- This breaker should switch off phase and neutral in case of electrical problems or when the user wish to service the instrument. However the power supply earth must always be connected.
- Cabling should be specified for a minimum of 80°C (176°F).

Note :

Before servicing the instrument, ensure that the power supply is switched off.

Relays connections

The 9125 is equipped with 4 relays. Relay S4may 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 figure 3.1 page 17 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.

Output current connections (mA output)

The transmitter has two analogue outputs, which may be set in 0-20 or 4-20 mA and which are galvanicly insulated from the controller. Maximum load for each output is 800 Ω. See Figure 3.1 page 17 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.

Sensor connections

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

Execute the connections according to the following table :

	Kohlrausch	Inductives
TEMP+	**blue**	**green**
TEMP-	**black**	**yellow**
IN	**white**	**white**
OUT	**red**	**brown**
GND	**internal shield**	**internal shield (X2)**
	**external shield**	**external shield**

- Use only Ultra Analytics supplied cables.
  Using other types of cables does not ensure the conformity to the electromagnetic compatibility standards.

4. Using the 9125 transmitter

Utilization rules for the menus

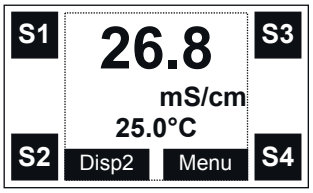
The user interface of the 9125 transmitter is made of a display screen and 4 keys.

The (**Esc**) key is used to go back to the previous menu.

The (**Enter**) key is used to validate the selections and the data.

Both middle keys, right and left function keys, are defined according to the words and symbols which are displayed above each function key.

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



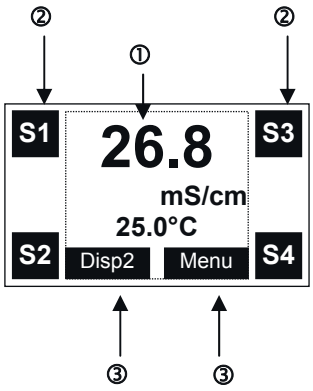
Modification of a value

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

Note :

- ***If you do not use the display for at least 10 minutes, the instrument returns to the measuring mode except for the calibration and maintenance mode.***
- ***An access code may be required for the calibration, programming and service menu (see CODE menu).***

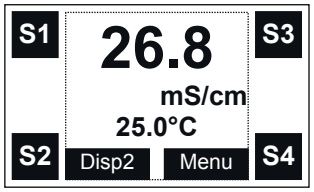
Measures display



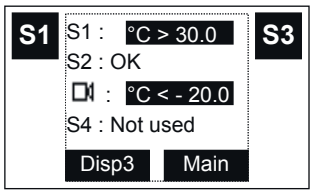
Measures display allow to display measures and state of the device. There are three :

Reference	Description
①	Main display
②	Alarm state
③	Function keys

Main display

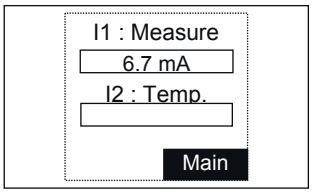


26.8 mS/cm : conductivity measurement
25.0 °C : temperature measurement
S1...S4 : alarm status (invisible if alarm inactive).



Display 2

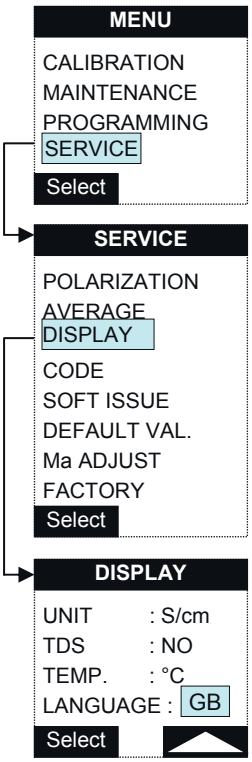
S1...S4 : alarm status
S1 : activated by a temperature > 30.0°C
S2 : inactive
: S3 in alarm system
S3 closed by a temperature < - 20.0°C
S4 : not used



Display 3

Analogue outputs allocation:
measure or temperature.
Display of each output value with a bargraph + mA indication.

Display options



Choice of the language

English is the default language. You can choose an other language available (French, German, Italian, Spanish or Dutch) by following the procedure below :

- Use the right function key **MENU.**
- Use the left function key **(Select)** to select the menu **SERVICE** and press **(Enter)**.
- In the menu **SERVICE**, use the left function key **(Select)** to select **DISPLAY and press (Enter)**.
- Select the language of your choice with the right function key. **"**Press (**Enter)"**.

S/DISPLAY Menu

– UNIT : choice of the display of conductivity/resistivity measurement.
  - S/cm
  - Ω.cm
  - S/m
  - Ω.m

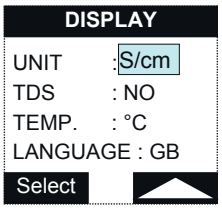
– TEMP. : choice of the temperature measurement.
  - °C
  - °F

– LANGUAGE : choice of the message language.
  - French,
  - English,
  - German,
  - Spanish,
  - Italian,
  - Dutch.

– Press **Esc** to go back to the DISPLAY menu.

UNIT choice

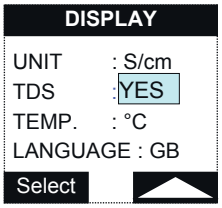
As the language used, it's possible to choose the units of the measures in which they will be display.



– Unit. allows to choose one of the units in conductivity or resistivity in which values will be done.

- S/m
- Ω.cm
- S/cm
- Ω.m

TDS choice

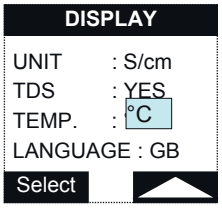


– TDS : yes/no.

When the option TDS is selected **(Yes)**, the measurements will be displayed in concentration units : in ppt (pare per thousand), ppm (part per million) ppb (part per billion) according to the measurement level.

When the option TDS is not selected **(No)**, measurements are displayed in Ω.cm or S/cm according to the unit selected ; Menus for calibration of the TDS measurement are not displayed anymore.

Temperature UNIT choice



Allow to choose a temperature display between Celsius or Fahrenheit degree.

Concentration measure (TDS)

The Total Dissolved Solid (TDS) measure is a concentration measure in the limits of measure where, for a part given, the concentration of the solution is proportional to its conductivity.

The next board show for the mains solutions, the relations existing between concentration and conductivity (in ppm).

The white part of the board show the limits where the TDS display is possible.

The measure in concentration (TDS) is given by the formula :

TDS = Cond x KTDS

The KTDS coefficient is calculated during the process calibration of the device. It must be between 0.00 and 5.00. If it is not in this interval, an error message will display during the calibration.

Limits of the TDS measure

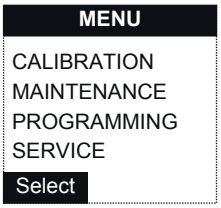
For different substances, the limits of the measure where the concentration is proportional to the conductivity is given by the white part of the next board:

Weight %	ppm	NaCl	NaOH	NH4OH	NH3	HCl	H2SO4	HNO2	HF	SO2	Acid Acetic
0,0001	1	2,2	6,2	4,1	6,6	11,7	8,8	6,8	10	6,4	4,2
0,0003	3	6,5	8,3	8,3	12	50	61	20	30	18	7,4
0,001	10	21,4	61,1	17	27	116	85,6	67	99	54	15
0,003	30	64	182	31	49	340	251	199	290	150	30,6
0,01	100	210	603	58	84	1140	805	657	630	450	63
0,03	300	617	1780	102	150	3390	2180	1950	1490	1200	114
0,1	1000	1990	5820	189	275	11100	6350	6380	2420	3600	209
0,3	3000	5690	16900	329	465	32200	15800	18900	5100	7900	368
1	10000	17600	53200	490	810	103000	48500	60000	11700	17200	640
3	*30000*	48600	144000	790	1110	283000	141000	172000	34700	32700	1120
5	*50000*	78300	223000	958	1115	432000	237000	275000	62000	42000	1230
10	*100000*	140000	358000	1115	1120	709000	427000	498000	118000	61000	1530
20	*200000*	225000	414000	968	4251	850000	709000	763000	232300		1600
30	*300000*		292000	725		732000	828000	861000	390000		1405
40	*400000*		191000	460			770000	820000			1080
50	*500000*		150000				620000	717000			740
75	*750000*						182000	340000			168
100	*1000000*						10000	50000			1

The unit of the conductivity is µs/cm.

5. Programming the transmitter

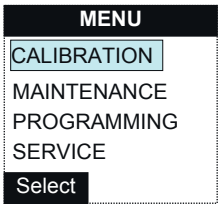
Main menu

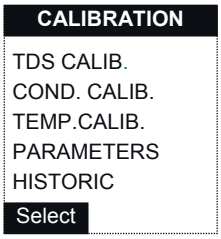


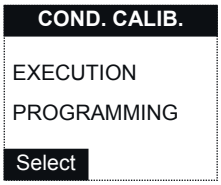
The main menu gives access to 4 main functions of the instrument :

- The **CALIBRATION menu** enables to adjust the instrument measurement according to the reference measurements.
- The **MAINTENANCE** menu enables to intervene on the instrument.
- The **PROGRAMMING menu** enables to program the instrument according to the application.
- The **SERVICE** menu is reserved to qualified servicing personal.

Calibration Menu







Note :

Before any calibration launching, check the parameters of the MEASURE menu (probe type, temp. Comp.) Are correctly configured.

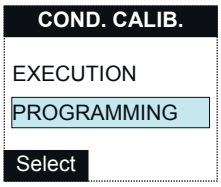
(See page 25).

This option allows to calibrate the conductivity measure, the temperature measure and to display the concentration measure (TDS).

Conductivity calibration

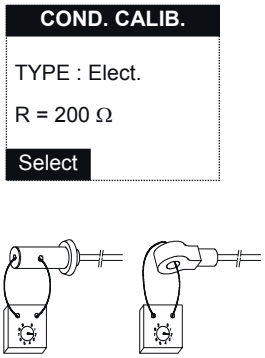
With the help of the « select » function touch, choose COND. CALIB. option. Two options appears :

- PROGRAMMING allows to choose the electric conductivity calibration type :
  - 2 points
  - 1 point.
- EXECUTION will allow to do the desired calibration type.



Select to "Programming" and press enter.

Select the calibration type and press enter.



Type of calibration

- **With a 2 electrode probe**

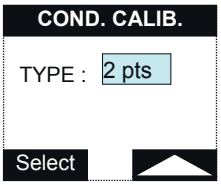
  For the first point, remove the probe from liquid or unscrew the connector from the probe.

  For the second point connect a resistance to the IN/OUT terminal of the conductivity module.

- **With an inductive probe**

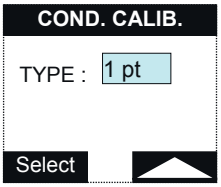
  For the first point, remove the probe from liquid.

  For the second point connect a resistance with a looped wire through the probe.



2 point calibration

For the first point, remove the probe from liquid or unscrew the connector from the probe (2 electrode probe) in a known concentration solution. The user enters this solution value when calibrating.



1 point calibration

Immerse the probe in a known concentration solution. The user enters this solution value when calibrating.

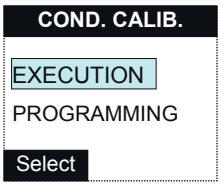
Note :

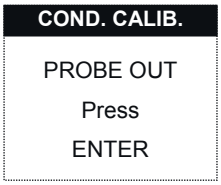
Warning ! This calibration is only active on the slope

The first point of the electric calibration and 2 point calibration enables to realise an internal electronic calibration and to measure the cable capacity with a 2 electrode probe.

It is mandatory to realise one of both calibrations when starting the MONEC D9125 for the first time.

For the second calibration point use a resistance or a solution with a significant difference from the first point.





EXECUTION

Execution of a 2 point calibration

Program the manual 2 point calibration and execute it as follows :

- Remove the electrode from liquid.
- When the measure is stable, the instrument goes automatically to next step.

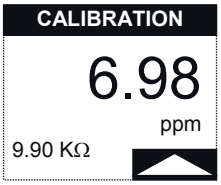
The symbol flashes 10 to 20 seconds.

- Press ENTER to accept the zero calibration.
- Immerse the probe in the calibration solution
- When the measure is stable, press OK.
- Change the value displayed if you want.
- Modify the date of the calibration if necessary by pressing on the right function touch .
  To validate the calibration parameters press ENTER. ESC does not validate the parameters and the former calibration parameters are kept.

TDS measure calibration

This option is available only if you have selected the measurement TDS in the menu DISPLAY.

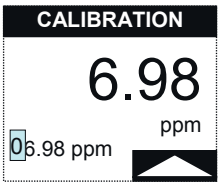
Select with the function key Choice **CALIB TDS** in the menu **CALIBRATION** and press ENTER.



This calibration permits to adjust the coefficient K TDS between the concentration value and conductivity.

The measurement TDS is displayed as well as the conductivity value as secondary measurement.

Proceed to the following steps :

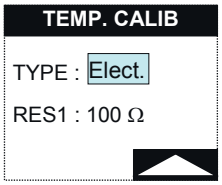


- Press the function key **OK**.
- Change the displayed value and enter the sample value (TDS).
- The instrument indicates the result of the coefficient calculation TDS and press ENTER.

Temperature calibration

With the help of the right function touch choice, select the programming line and press ENTER.

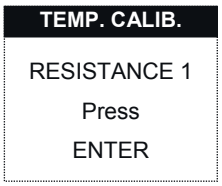
The right function touch allow to select 2 types of calibration, electric or process.



Temperature electric calibration / Resistor adjust

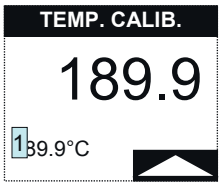
This calibration is factory realised.

Used to realise an electric calibration for the Pt100 measurement. 2 resistances of known values should be connected to the temp + and temp - of the module measure. This resistors should have a precision about 0,1%.



Proceed as follows :

- Launch the calibration when you have configured an electric calibration. Lancer l'exécution après avoir configuré l'étalonnage en étalonnage électrique.
- The transmitter requires the connecting of the first resistance.
- Press **Enter.**
- Repeat the same procedure for the second resistance.



Process calibration

Proceed as follows after you have configured a process calibration :

- Wait till the measurement is stable and press the right function key **OK.**
- You have the possibility to change the value
- Press **Enter.**
- The instrument executes a zero adjustment required to display the value configured.

PARAMETERS Menu

PARAMETERS
DATE : 01/01/01
SLOPE : 100%
COEFF : 0.50
ΔT : -0.0°C

This menu displays the calibration parameters of the conductivity measurement.

Date of last calibration. This date is the date the user has entered after a conductivity calibration (electric, 2 points, 1 point).

The other parameters are those which are displayed when the date is registered :

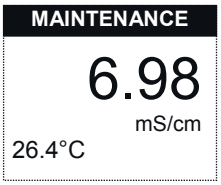
- Slope of the last calibration which is a correction factor of the conductivity probe slope.
- Si la mesure est effectuée en TDS, le coefficient de proportionnalité entre la conductivité et la concentration.
- Drift of the temperature measurement.

HISTORIC Menu

HISTORIC
DATE : 01/01/01
SLOPE : 100%

This menu displays the conductivity slopes corresponding to the last two conductivity calibrations and allows to follow the probe clogging.

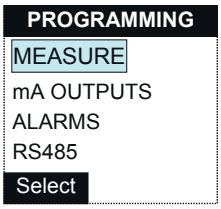
MAINTENANCE Menu



When changing or cleaning a probe or servicing the instrument, the transmitter continues to display measures.

The analogue output value is the value programmed in the mA menu. The relay status is not modified.

PROGRAMMING Menu

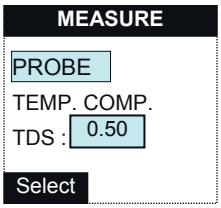


Note :

Warning ! An access code may be required if programmed.

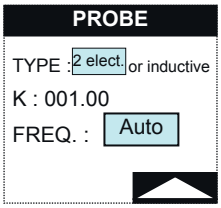
This menu enables the configuration of the instrument according to its application.

In this operating mode, the measurements, the analogue outputs and alarms remain active.



S/MEASURE Menu

The PROBE menu allows to configurate the utilized probe type, TEMP. COMP. the temperature compensation, TDS the TDS measure coefficient when it is actived.



PROBE

This menu allows to choose the utilized probe for the conductivity measure.

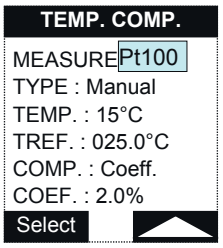
TYPE :	- Induct.	choice of the electrode :
	- 2 elec.	Inductive or 2 electrodes

Note :

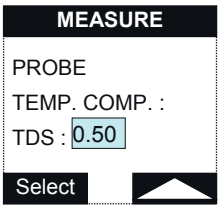
Check both switches of the conductivity module are correctly positioned :
- K : 2 electrodes
- I : inductive

K :	XXXX	Adjustment of the cell constant.
FREQ. :	- Auto	Choice between an automatic adjustment of the frequency according to the measurement or one of the pre-programmed frequencies. (see Chapter 5 for further details).
	- 8000	
	- 4000	
	- 2000	
	- 1000	
	- 500	
	- 250	Only if elect. 2 type has been selected.
	- 125	
	- 62,5	

TEMPERATURE COMPENSATION



MEASURE :	- No - Pt 100 - Pt1000	Choice of a temperature measurement with or without Pt100 / Pt1000.
TYPE :	- No - Auto. - Manual	Choice between no temperature compensation or an automatic or a manual temperature compensation mode.
TEMP. :	XX	Possibility to enter the sample temperature in a manual compensation.
TREF :	XX	Possibility to enter the reference temperature.
COMP. :	- Coef. - HCl - NaCl	Possibility to choose the temperature compensation.
COEF :	XX	Possibility to enter the coefficient value.



TDS coefficient adjusting

TDS coefficient adjusting is directly in the MEASURE menu.

Utilize the **left** function touch to choose the TDS adjusting.

TDS : Choose the TDS coefficient which is necessary to calculate the solution concentration.

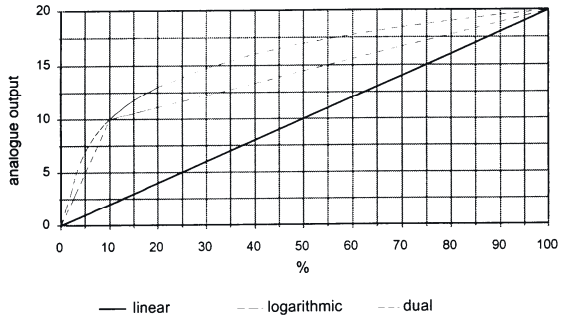
Utilize the **right** function touch to choose a value between 0 and 5.

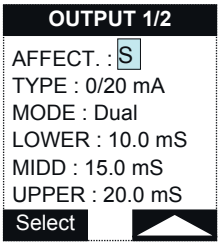
mA OUPUTS

OUTPUT 1
OUTPUT 2
SPECIAL PROG.
TEST
Select

S/mA OUTPUTS Menu

This menu allows to adjust analogue outputs.





OUTPUT 1/2

– AFFECT. : choice if the analogue output allocated to measure or temperature.

- S/Ω
- °C/°F

– TYPE : choice of the analogue output type.

- 0/20 mA
- 4/20 mA

– MODE : choice of operating mode : linear, logarithmic or dual.

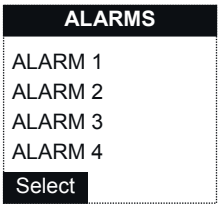
*** In logarithmic mode , the beginning of range should be different from 0.**

- Lin
- Log
- Dual

– LOWER : limit value programming.

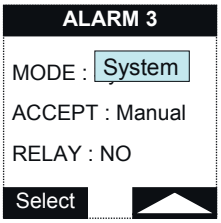
– MIDD. : middle value only in ***dual mode***.

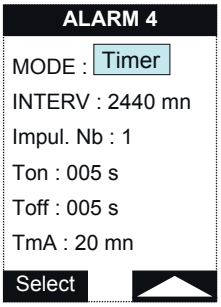
– UPPER : upper limit value programming.



S/ALARMS menu

This sub-menu allows to reach the configuration of alarms 1 to 4.



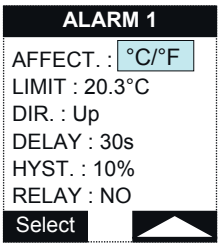


The MODE parameter allows to choose the operating mode of the 4 alarms :

- Limit : alarms 1...4
- USP : only alarms 1 and 2
- System : only alarm 3
- Timer : only alarm 4

MODE :
- No
- Limit
- USP
- System
- Timer

ALARM 1/2 (limit)



– AFFECT. : choice of a limit on the measurement or on the temperature.
  - No
  - S/Ω
  - °C/°F

– LIMIT : value of the limit.

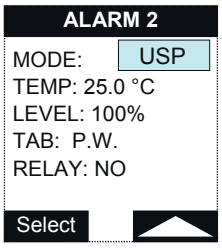
– DIR. : choice of the direction :
  - Up
  - Down

– DELAY : definition of the temporisation when the relay is interlocking (in seconds).

– HYST : definition of the hysteresis in % (10% max).

– RELAY : choice of the relays normally opened or closed.
  - NO
  - NF

ALARM 1/2 (USP)



– The TEMP menu allows the temperature to be entered in cases where no measurement is provided by Pt100/Pt1000. If temperature is measured automatically, this menu is not displayed.

– The LEVEL menu is used to set the safety margin with respect to the USP standard: with a level of 50%, the 1.9 µS/cm threshold (50°C) drops to 0.95 µS/cm.

– The TAB menu is used to configure the stored USP curve: W.F.I. (Water For Injection) or P.W. (Pure Water).

USP mode

USP is a standard used in the pharmaceutical industry. It recommends the use of a ***non temperature-compensated*** conductivity measurements and sets the upper limits of acceptable conductivity for USP-compliant water according to temperature. The alarm delivered therefore varies according to the measured temperature. For this, the instrument possesses two stored curves:

– a curve (W.F.I.) for conductivity measurements in **high purity water or for injectable preparations** (cf. table 1),

– a curve (P.W.) for conductivity measurements in **purified water** (cf. table 2).

NB:
This function is only possible in 2 electrode measurements and when temperature compensation has been deactivated.

T°C	Non-compensated conductivity µS/cm	T°C	Non-compensated conductivity µS/cm	T°C	Non-compensated conductivity µS/cm
0	0.6	35	1.5	70	2.5
5	0.8	40	1.7	75	2.7
10	0.9	45	1.8	80	2.7
15	1.0	50	1.9	85	2.7
20	1.1	55	2.1	90	2.7
25	1.3	60	2.2	95	2.9
30	1.4	65	2.4	100	3.1

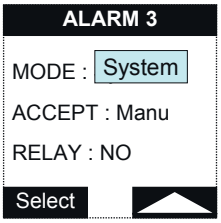
*Table 1 - Temperature curve and conductivity requirements for **high purity water or for injectable preparations** (non temperature-compensated conductivity measurements).*

Example: if the measured temperature is equal to 22°C, the threshold is of 1.1 µS/cm and shall remain at this value as long as the temperature stays at 22°C. If the temperature varies, rising to 25°C, the threshold automatically switches to 1.3 µS/cm.

NB: The delivered alarm corresponds to the value of the threshold associated with the USP temperature immediately below the measured temperature (i.e. 20°C and 25°C in the previous example).

T°C	Non-compensated conductivity µS/cm	T°C	Non-compensated conductivity µS/cm	T°C	Non-compensated conductivity µS/cm
0	2.4	35	5.95	70	9.1
5	3.0	40	6.5	75	9.7
10	3.6	45	6.8	80	9.7
15	3.95	50	7.1	85	9.7
20	4.3	55	7.6	90	9.7
25	5.1	60	8.1	95	9.95
30	5.4	65	8.6	100	10.2

*Table 2 - Temperature curve and conductivity requirements for **purified water** (non temperature-compensated conductivity measurements).*



ALARM 3 (Alarm system)

– In case of an alarm 3, choice between a limit alarm or alarm system function.

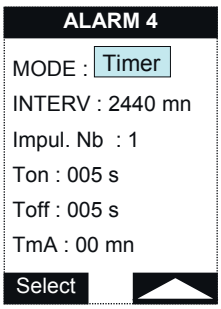
MODE :
- No
- Limit
- System

– In case of an alarm system, choice between an automatic accept or a manual accept.

ACCEPT :
- Auto
- Manu

– Choice between relays normally open or closed.

RELAY :
- NO
- NC



ALARM 4 (Timer)

– In case of an alarm 4, choice between a limit or a timer function.

MODE :
- No
- Limit
- Timer

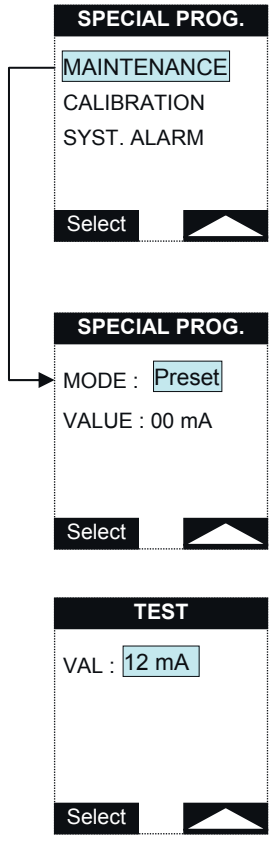
– INTERV : interval between two cleaning cycles in minutes.

– Impul. Nb : number of pulses during a cleaning cycle.

– Ton : time when relay is activated, in seconds.

– Toff : time when relay is desactivated, in secondes.

– TmA : hold time for the analogue outputs in minutes.



S/SPECIAL PROG. Menu

This screen allows to adjust 4..20 mA outputs states in special events :

- MAINTENANCE
- CALIBRATION
- SYST. ALARM

- MODE : choice of a preset value during calibration, alarm system or maintenance or timer.
  - last
  - preset
  - live
- VALUE : indication of the preset value, 0 to 21 mA.

TEST

TEST menu test the analogue outputs by step of 1 mA (0…21mA).

RS485
N° : 4
BAUD : 9600
PARIT. : odd
BIT STOP : 1
SWAP WORD : NO

S/RS485 Menu

This option requires the RS485 kit.

N°	Monec number (0...32)
BAUD	300/600/1200/2400/4800/9600/19200 Transmission speed in bauds
PARIT.	- Without parity bit : No - With odd parity bit : Odd - With even parity bit : Even
BIT STOP	- 1 bit stop - 2 bits stop
SWAP WORD	Allow to reverse the « strong weight », « light weight » size during the manipulation of the real variable (float type). Some equipment need this reverse to read correctly the real size data.

The communication protocol is MODBUS/JBUS.

The instrument may be equipped with a RS485 board (optional) (see MODBUS 9100 manual).

SERVICE Menu

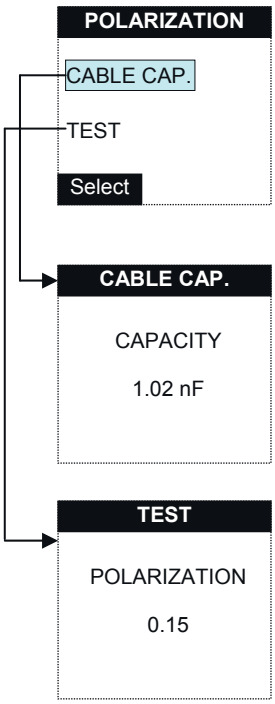
SERVICE
POLARIZATION
AVERAGE
DISPLAY
CODE
SOFT ISSUE
DEFAULT VAL..
mA ADJUST
FACTORY
Select

Note :

An access code may be required if it has been programmed.

This screen allows to reach the 9125 transmitter configuration screens.

The display options are detailed page 26.



S/POLARIZATION Menu

This menu is displayed only if you use a 2 electrode probe.

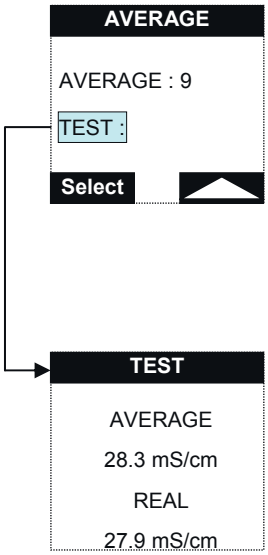
CABLE CAP.

CABLE measure the electrode cable capacity.

It is mandatory to disconnect the probe connector to measure the capacity or to make an electric calibration.

TEST

TEST measure the electrode polarization (see Chap. 5). An error message is displayed if the polarization is superior to 0,25.



S/AVERAGE Menu

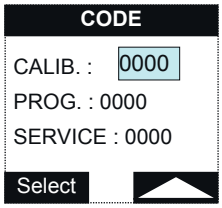
S/AVERAGE menu program a moving average on the measurement.

AVERAGE : define the number of measures to calculate the average.

TEST : visualize the difference between a measure done with or without average.

Note :

The measurement cycle lasts 4 seconds if there is a temperature measurement and only 2 seconds without temperature measurement.

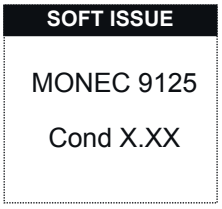


S/CODE Menu

- CALIB. : access code for temperature and conductivity calibrations menu.
- PROG. : access code for "Programming" menu.
- SERVICE : access code for "service" menu.

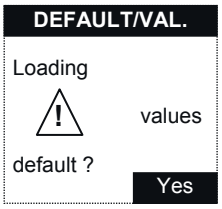
Note :

If you have forgotten your access code, press simultaneously ESC and ENTER to enter into the menu.



S/SOFT ISSUE Menu

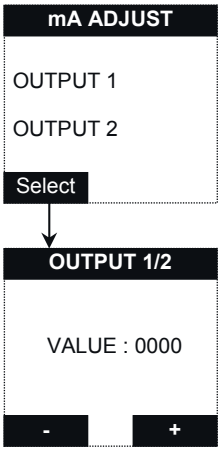
The transmitter displays the type of instrument and the software version installed.



S/DEFAULT/VALUES Menu

Note :

If you press YES, you load the default values and you loose the programmed values and the calibration parameters.



S/mA ADJUST Menu

This menu adjustment of the analogue outputs to 20 mA with an internal coefficient between -9999...9999.

S/FACTORY Menu

Factory code necessary.

The user has no access to this menu.

6. Polarization

Electric representation of the probe and its cable

In a conductivity measurement with a 2 electrode probe the measurement current is transmitted via the electrodes. The current is ensured by electrons in the electrodes and by ionic migration in the solution measured. An electron exchange process occurs between the solution and the electrodes.

A significant example below :

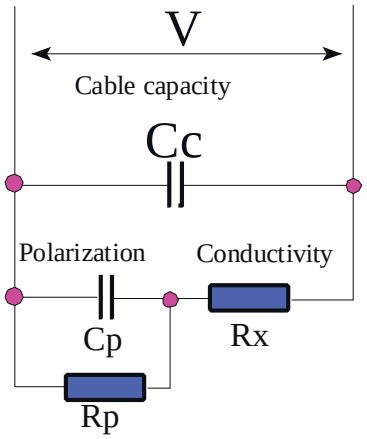
$$2\ H_2O = H^+ + O_2 + 4e^-$$

and

$$2\ H_2O + 2e^- = H_2 + 2\ OH^-$$

This reaction requires energy and causes a potential difference which does not rely on conductivity.

This phenomenon is known as polarization and may be represented by the scheme below :



electric equivalent of the conductivity probes

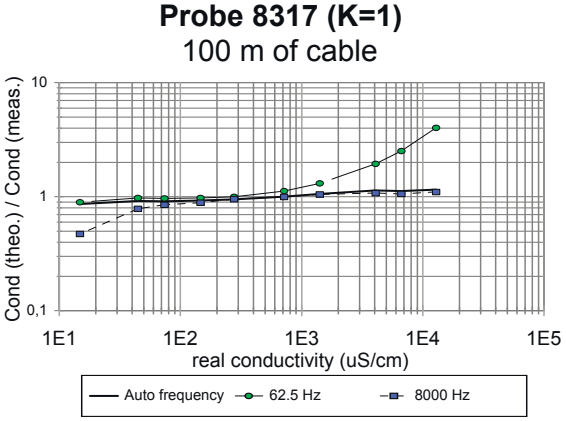
where :

The dipole Rp, Cp represents the active and reactive part of the energy necessary to the electron exchange between the sample and the electrodes.

and :

Cc : the cable capacity

Frequency adjustment according to the conductivity measurement



In the example below 3 measuring ranges are described :

- **measuring range 1 µS/cm to 100 µS/cm :**

  When the measuring frequency is high, the cable capacity becomes important and induces an error in the conductivity measurement.

  If you use a long cable, use the lowest frequency possible.

- **measuring range 100 µS/cm to 1 mS/cm :**

  In this measuring range the cable capacity or the polarization are negligible and do not perturb the conductivity measurement.

- **measuring range 1 mS/cm to 20 mS/cm :**

  When the measuring frequency is low, the polarization becomes important and induces an error in the conductivity measurement.

  It is required to use a high frequency.

Automatic adjustment of the frequency

The 9125 adjusts automatically the measurement frequency according to the conductivity measured, the cable capacity and the polarization.

The cable capacity is measured in the calibration of the first calibration point or in the menu SERVICE\POLARIZATION\CABLE CAPA.

Polarization is regularly measured and an error message is displayed if it is too high.

7. Error messages

> ***Note :***
>
> ***In manual acquittal, in order to suppress an error message press ENTER after correcting the default.***

ERROR MESSAGE	DESCRIPTION/POSSIBLE CAUSE
10.3 **mS/cm** **Pt100/Pt1000 SHORT CIRCUIT**	➢ Sensor not correctly connected Temperature sensor damaged Replace it if necessary.
12.7 **mS/cm** **Pt100/Pt1000 OPEN CIRCUIT**	➢ Sensor not correctly connected Temperature sensor damaged Replace it if necessary.
60 **Ω.cm** **MEASURE TOO LOW**	➢ The resistivity value is inferior to the lower limit of the measuring range.
15.2 **mS/cm** **MEASURE TOO HIGH**	➢ The conductivity value is superior to the upper limit of the measuring range.
15.2 **mS/cm** **POLARIZATION TOO HIGH**	➢ The electrode polarization is too high.

ERROR MESSAGES DURING A CALIBRATION

Note :

Press ESC to leave the menu and calibrate again.

COND. CALIB.

OFFSET OUT OF LIMITS

- The electronic zero shift is superior to the limit programmed.
  Calibrate again.

COND. CALIB.

SLOPE : 162 %

SLOPE OUT OF LIMITS

- The slope shift is superior to the limit programmed.

  Limits : 50...150 %

TEMP. CALIB.

ΔT : -30.0°C

ΔT OUT OF LIMITS

- The temperature drift is superior to the limit programmed.

  Limits : ± 20 °C

Appendix A : Default values

CALIBRATION

COND. CALIB.
TYPE : Electr.
RES. : 1000 Ω

TEMP. CALIB.
TYPE : Process

PARAMETERS
DATE : 01/01/01
SLOPE : 100.0%
ΔT : 0.0°C

PROGRAMMING

MEASURE

PROBE
TYPE : 2 elect.
K : 001.00
FREQ. : Auto

TEMP. COMP.
MEASURE : No
TEMP. : 025.0°C
TREF. : 025.0°C
COMP. : Coef.
COEF. : 2.0 %

ALARMS

ALARMS S1		**ALARMS S2**		**ALARMS S3**		**ALARMS S4**	
AFFECT.	: S	AFFECT.	: S	AFFECT.	: S	AFFECT.	: S
LIMIT	: 10.0 mS	LIMIT	: 10.0 mS	LIMIT	: 10.0 mS	LIMIT	: 10.0 mS
DIR.	: Down	DIR.	: Down	DIR.	: Down	DIR.	: Down
DELAY	: 000 s	DELAY	: 000 s	DELAY	: 000 s	DELAY	: 000 s
HYST.	: 00%	HYST.	: 00%	HYST.	: 00%	HYST.	: 00%
RELAY	: NO	RELAY	: NO	RELAY	: NO	RELAY	: NO

mA OUTPUTS

OUTPUT 1
AFFECT. : S
TYPE : 4-20
MODE : Lin
LOWER : 1.0 µS
UPPER : 10.0 µS

OUTPUT 2
AFFECT. : °C
TYPE : 4-20
LOWER : 0 °C
UPPER : 100 °C

SPECIAL PROG.

MAINTENANCE
MODE : Last

CALIBRATION
MODE : Last

TIMER
MODE : Last

SYST. ALARM
MODE : Last

RS485

No : 1
BAUD : 19200
PARITY : No
STOP BIT : 1
SWAP WORD : No

SERVICE

AVERAGE

AVERAGE : 1

DISPLAY

DISPLAY
UNIT : S/cm
TEMP. : °C
LANGUAGE : GB

CODE

CODE
CALIB. : 0000
PROG. : 0000
SERVICE : 0000

Appendix B : Spare parts list

No other spare parts except those below in the table should be replaced in the instrument.

Part number	Description
09125=A=1001	9125 equipped CPU board
09125=A=1500	9125 complete conductivity module
09125=A=2000	9125 power supply (standard version)
09125=A=2020	9125 power supply (low voltage version)
09125=A=4000	Relay board (option)
09125=A=1101	RS485 board (option)
09125=A=2485	RS485 kit (JBUS/MODBUS manual +board)
09125=C=3000	Mounted transmitter housing
425=110=221	Cable gland PG11
425=135=222	Cable gland PG13,5
351=007=001	Strap FLEXPAC 7 PTS
621=091=025	French instruction manual
621=191=025	English instruction manual
621=291=025	German instruction manual
621=491=025	Italian instruction manual
621=591=025	Spanish instruction manual
621=891=025	Dutch instruction manual
621=991=000	JBUS/MODBUS communication manual