



DOC024.52.93025

POLYMETRON Model 8362 pH Measurement

User Manual

05/2015, Edition 11

Restriction of hazardous substances (RoHS)

The European Union RoHS Directive and subsequent regulations introduced in member states and other countries limits the use of six hazardous substances used in the manufacturing of electrical and electronic equipment.

Currently, monitoring and control instruments do not fall within the scope of the RoHS Directive, however Hach Lange has taken the decision to adopt the recommendations in the Directive as the target for all future product design and component purchasing.

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



含有有毒或者危险物质及成分的产品。

环保使用期限标记 (年)

有毒或者危险物质和成分						
部件名称	铅	汞	镉	六价铬	多溴联苯	多溴联苯醚
Conductivity plastic sensor (8310, 8311, 8312)	O					
Conductivity stainless steel sensor (8314, 8394)	O				O	
Digital sensor PCB	O				O	
Glass electrode	O				O	

O: 表示所有此类部件的材料中所含有毒或危险物质低于限制要求

x: 表示至少有一种此类部件材料中所含有毒或危险物质高于限制要求

Transmitter 9135 - pH measurement in pure water



This instrument conforms to the European Directives:

- 2004/108/EC EMC Directive
- 2006/95/EC Low Voltage Directive

Warning !

There are no user-serviceable parts in either the transmitter or sensor. Only Hach Lange 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.

Hach Lange

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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

Hach Lange.....	2
Table of contents	1
1. General description of the system for pH measurement in pure water.....	3
Presentation of the 9135 transmitter	3
Introduction	4
Theory.....	4
Description of the system for pH measurement in pure water	6
Characteristics	7
2. Installation of the chain for measuring pH in pure water	13
Unpacking the 9135 transmitter and the 8362 probe	13
Advice for installation	13
Mounting types.....	14
3. Electric connections.....	17
Electronic board lay-out in the 9135 transmitter enclosure	17
Main connection.....	19
4. Hydraulic connection	21
Preparation of system measurement (Model 8362-1)	21
Hydraulic connections.....	21
Flow rate and pressure	21
Electrical connection of the measurement system (Model 8362).....	23
5. Using the 9135 transmitter.....	27
Utilization rules for the menus	27
Modification of a value	28
Measures display	28
Main display	29
Display options.....	30
Choice of the language.....	30
S/DISPLAY Menu	30
6. Configuration of the 9135 transmitter	31
MAIN menu	31
CALIBRATION menu	32
pH calibration.....	32
Buffer solutions	32
Choice of the calibration type	34
Automatic calibration	34
2 point calibration.....	35
Process calibration	35
Values calibration	35
Slope and offset limits.....	35

Transmitter 9135 - pH measurement in pure water

Temperature calibration.....	36
Calibration proceedings example	37
Manual calibration, automatic temperature compensation mode	37
Buffer 1	37
Buffer 2	38
PARAMETERS Menu	40
HISTORIC Menu.....	40
MAINTENANCE Menu.....	40
PROGRAMMING Menu.....	41
S/MEASURE Menu.....	42
S/mA OUTPUTS Menu.....	44
S/SPECIAL PROG. Menu	45
S/ALARMS Menu.....	46
S/CONTROLLER Menu.....	49
S/RS485 Menu	54
SERVICE Menu	55
S/AVERAGE Menu	56
S/DISPLAY Menu	56
S/CODE Menu	57
S/SOFT ISSUE Menu.....	58
S/DEFAULT/VALUES Menu.....	58
S/ma ADJUST Menu.....	59
S/FACTORY Menu	59
7. Failures detection and error messages.....	61
Failures detection.....	61
Electrode cleaning	62
Maintenance	62
Error messages.....	62
8. Analogue outputs and temperature control.....	67
Analogue outputs control.....	67
Pt100 simulator connections.....	68
pH simulator connections	68
Appendix A : Default values	1
Appendix B : Spare parts list.....	1

1. General description of the system for pH measurement in pure water

Presentation of the 9135 transmitter

The 9135 pH transmitter and associated measuring sensors has been designed for measuring and continuous control of pH or redox potential (with possibility of temperature measurement) in industrial process.

An automatic control of the sensor defaults improves the preventive servicing of the measuring chain.



2 analogue outputs (0/4 – 20 mA) may be freely programmed.

Note :

The programming is displayed in 6 languages. To modify this parameter see § 4 Changing the programming language.

Four relays and RS485 are available in option.

Introduction

PH Measurement

Theory

pH is the negative logarithm of the hydrogen ion activity and a measure of the acidity, or alkalinity of a solution.

$$\text{pH} = -\log a [\text{H}^+]$$

pH is normally measured using a glass electrode and a reference electrode.

The glass electrode acts as a transducer, converting chemical energy (the hydrogen into activity) into an electrical energy (measured in millivolts). The reaction is balanced and the electrical circuit is completed by the flow of ions from the reference solution to the solution under test.

The electrode and reference solution together develop a voltage (emf) whose magnitude depends on the type of reference electrode, the internal construction of the glass electrode, the pH of the solution and the temperature of the solution. This voltage is expressed by the Nernst equation :

$$E = E_o - (2.3 RT/F) \times \log a [\text{H}^+]$$

$$E = E_o - (\text{slope}) \times \log a [\text{H}^+]$$

Transmitter 9135 - pH measurement in pure water

where :

E = the emf of the cell

E_o = the zero potential (isopotential) of the system :
depends on the internal construction of the
glass and reference electrodes

R = gas constant

T = temperature in Kelvin

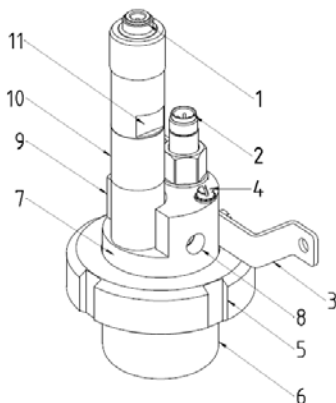
$a[H^+]$ = activity of the hydrogen ion (assumed to be
equivalent to the concentration of hydrogen
ions)

F = Faraday constant

For every unit change in pH (or decade change in ion concentration) the emf of the electrode pair changes by 59.16 mV at 25°C. This value is known as the Nernstian slope of the electrode.

The pH electrode pair are calibrated using solutions of known and constant hydrogen ion concentration, called buffer solutions. The buffer solutions are used to calibrate both the electrode isopotential and slope.

Description of the system for pH measurement in pure water



The probe 8362 is constituted of the following elements:

1. pH Electrode (unpluggable)
2. Temperature sensor (unpluggable)
3. U-bolt
4. Earth
5. Retaining nut for the chamber
6. Measurement chamber
7. Electrodes support
8. Thread 1/8" NPT, sample input
9. Filetage 1/8" NPT, sortie échantillon
10. Label to record the sensor installation date
11. Flat surface for wrench

The probe 8362-1 is provided with two unpluggable cables of length 3 m, one for the pH sensor and the other for the temperature sensor. As an option, cables of 10 m and 20 m can be supplied.

Transmitter 9135 - pH measurement in pure water

This high purity water pH sensor is specially designed for continuous in-stream pH measurement of pure and ultra-pure water.

It uses a reference electrode very similar to the measuring electrode (combined concentric electrode) in order to minimise the impedance under which the measurement is carried out.

It is made of 316L stainless steel, which protects the measurements from electrostatic (evacuation of the charges resulting from the passage of the low conductivity liquid) and magnetic disturbances.

The circulation chamber was designed without a retention zone in order to avoid any disturbance of the measurement by CO₂ dissolution and by the accumulation of air bubbles or insoluble deposits (iron oxide, residues salted out by the resins).

Characteristics

OPERATING CONDITIONS	
Ambiant temperature	-20°...+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)
MEASURE CHAMBER / Probe	
Pressure	16 bar/25°C 6 bar/100°C
Cable length	3 m
Flow	100 to 400 ml/mn

Transmitter 9135 - pH measurement in pure water

MEASURE	
Display range	0 ... 14 pH (possibility to measure up to -3 pH) -1500 mV.... 1500 mV -20 °C ... 200°C (-4 °F...392 °F)
Display resolution	0.01 pH / 0.1 pH (adjustable) 1 mV 0.1 °C
Measurement range with 8362 probe	2...12 pH 0...80 °C
Precision with 8362 probe	< 0,05 pH for vapour water cycle < 0,1 pH for ultra pure water
Repeatability with 8362 probe	0,01 pH / 24 h
Temperature probe	Pt 100
Automatic temperature compensation range	-20 ... 200 °C -4 ... 392 °F
Temperature compensation range	Nernst special compensation for ultra pure water like different tables or linear coefficient.
Sensor inputs	differential measurement
Input impedance	> 10 ¹² Ω
CALIBRATION	
Calibration type	- NIST (4 / 6.88 / 9;22) - DIN9 (4 / 7 / 9) - DIN10 (4 / 7 / 10) - 2 points (manual) - 1 point process - values (slope and offset)
Slope matching	41 ... 71 mV à 25 °C 70 ... 120 %
Zero matching	3 pH 250 mV
Temperature calibration	- 50 °C...+20°C (- 90 °F...+ 36°F)

Transmitter 9135 - pH measurement in pure water

CONTROLLER	
Setpoint	programmable in the range 0... 14 pH or -1500....+1500 mV
Neutral zone	programmable from 0...3 pH or 0... 200 mV symetric around the regulating point
Proportional band	programmable from 0...500 %
Periodicity	programmable from 3..60 seconds (impulse control) or from 1 à 30 seconds (frequency control)
Controller output	2 isolated contacts S1 and S2. S1 : base injection S2 : acid injection
Automatic/manual switch	possible
ANALOGUE OUTPUT	
Output signals	2 galvanicly outputs insulated
Allocation	pH / redox / temperature
Type	0 ... 20 mA 4 ... 20 mA
Maximum load	800 Ω
Accuracy	0.03 mA
ALARMS	
Alarm number	4
Function	- limits - alarm system - timer
Hysteresis	0 ... 10%
Temporization	0 ... 999 s

Transmitter 9135 - pH measurement in pure water

Breaking power (ohmic overcharge)	250 V AC, 5A max 100 V DC, 0,7A 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.
Response time	10 ms
Relaxation time	5 ms
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 x 64 pixels)
Protection codes	calibration programming service
ELECTRIC CHARACTERISTICS	
Power supply voltage	• standard version ($\pm 10\%$) : - 100 V ... 240 VAC 50/60 Hz • low voltage : - 13 - 30 VAC 50/60 Hz - 12 – 42 VDC
Preamplifier	± 9 V continu
Connections	screw terminals 2,5 mm ²
Consumption	25 VA
Fuse	5 x 20 mm cartridge T2AL - 250V

Transmitter 9135 - pH measurement in pure water

European standards	EN 61326 – 1 (Industrial level for immunity) EN 61010 – 1 (low tension main lines)
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UL and CSA agreement	ETL 3152732
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EMC conformity

MECHANICAL CHARACTERISTICS

Dimensions	144 x 144 x 150 mm
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Weight	2 Kg (transmitter) + 0,9 kg (probe 8362)
--------	--

Material	housing : Polyester coated aluminium screws : stainless steel
----------	--

Tightness	IP65
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Mounting types	wall pipe panel
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Cable glands and shutters	2 x PG13 and shutter 2 x PG11 and shutter
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2. Installation of the chain for measuring pH in pure water

Unpacking the 9135 transmitter and the 8362 probe

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,
- instruction manual,
- measurement system of pH in pure water model 8362,
- certificate of conformity to specifications.

Advice for installation

Choose a site where :

- vibrations are not too excessive,
- supply relays or commutators are away,
- maintenance will be easy,
- the ambient temperature and humidity must respect the specifications.

Note :

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

Mounting types

3 possibilities to mount the instrument (use of the red clamping bow) :

The transmitter housing conforms to norm DIN 43700.

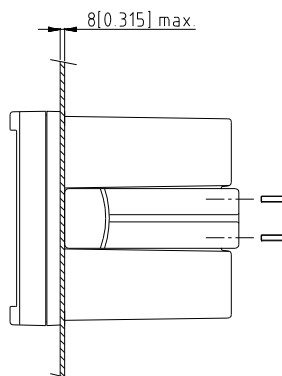
Panel mounting:

Panel cutting : 138 x 138 mm

Front panel dimensions : 144 x 144 mm

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

Fig 2.1 Panel mounting

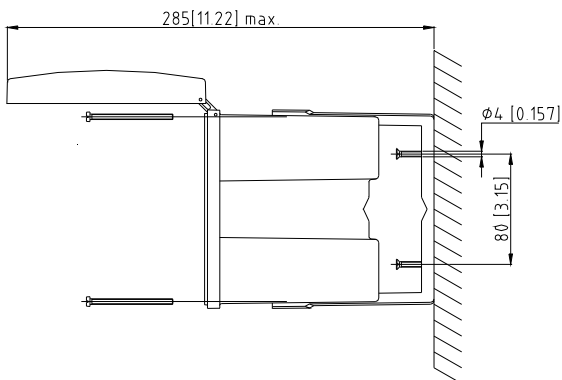


Panel cutting	138 x 138 mm (5.4 in. x 5.4 in.)
Front panel dimensions	144 x 144 mm (5.8 in. x 5.8 in.)
Thickness panel	Inferior to 8 mm

Wall mounting :

- 2 screws $\varnothing$ 4 mm lg 60 flat head (not provided)/ 80 mm center distance
-

Fig. 2.2 Wall mounting



Transmitter 9135 - pH measurement in pure water

Pipe mounting :

- $\varnothing$ 2" maximum - 2 screws $\varnothing$ 4 mm lg 60 (provided)

Fig. 2.3 Vertical mounting

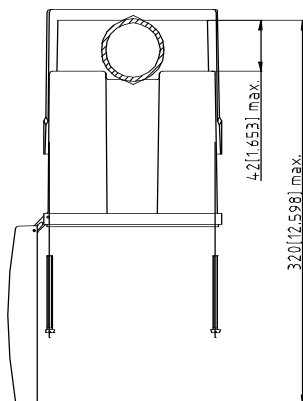
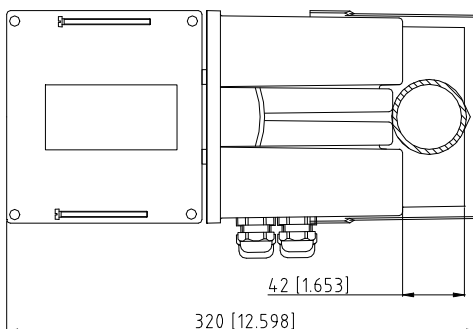


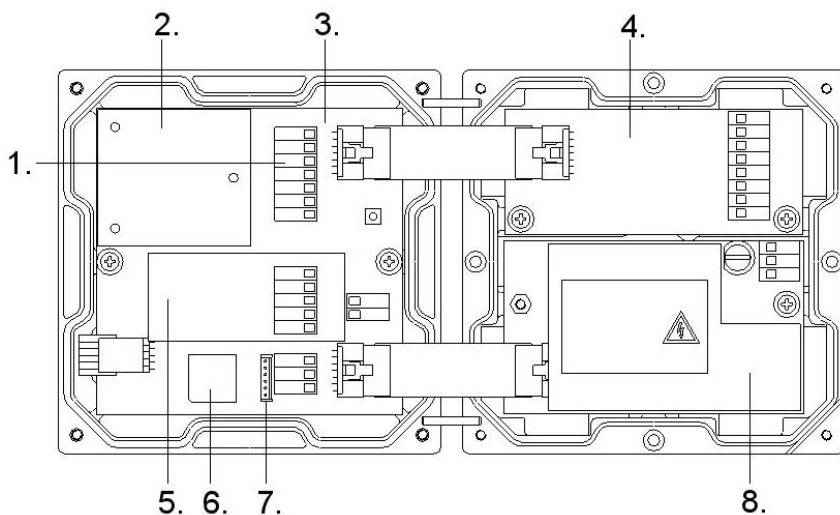
Fig. 2.4 Horizontal mounting



3. Electric connections

Electronic board lay-out in the 9135 transmitter enclosure

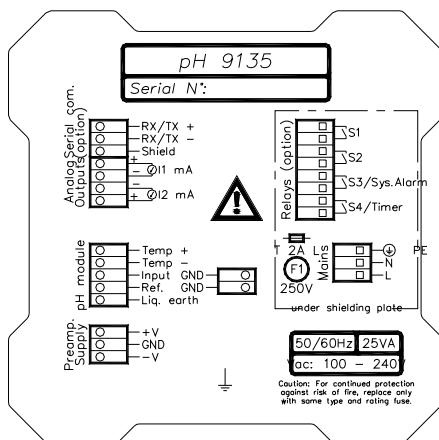
Fig. 3.1 Electronic board lay-out



1. Terminal block 4-20 mA
2. CPU board
3. RS485 board (option)
4. Relay board (option)
5. pH module
6. Programmed EEPROM
7. Program update connector
8. Power supply board

Transmitter 9135 - pH measurement in pure water

Fig. 3.2 9135 shielded plate



Supply terminals blocks and relays are under the shielded plate.

Note :

Electrical connections should remain dry to ensure a proper operation of the instrument.

Check the creeping of the cables when opening the transmitter.

It is required to use shielded cables. The shield should be linked to the main shielding.

Main connection

Electrical connection should be performed only by qualified personnel. The power supply accepts 100-240 VAC $\pm$ 10 %, without changes in configuration. 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.



Note :

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

4. Hydraulic connection

Preparation of system measurement (Model 8362-1)

- Unscrew the measure chamber.
- Remove the pH bulb protector boot covering the pH bulb and rinse the bulb area with deionized water or pH buffer. Save the boot if the electrode will be stored. It is possible that air bubbles may have migrated into the pH sensitive bulb during shipment. Since the electrode is not able to function with air behind the pH bulb, gently shake the electrode downward in the same manner as a clinical thermometer to remove any trapped air bubbles.
- Record the installation date on the label.

Hydraulic connections

- Re-screw the measure chamber.
- Assemble the 1/8" NPT connections in the 8 and 9 threads, then connect the sample inlet pipe in 8 and outlet pipe in 9 (see drawing next page).
- Circulate the sample and check visually through the chamber the absence of bubbles which could disturb the measurement.
- Adjust the flow to about 150 ml/mn.

Flow rate and pressure

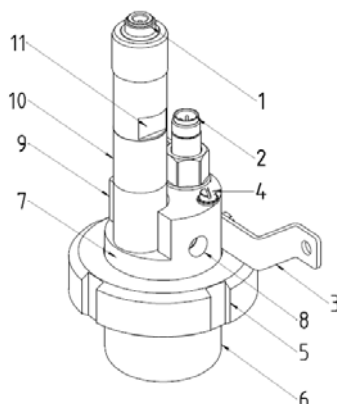
The streaming potential increasing with flow velocity, it is required to adjust the sample flow rate at a rate which does not exceed the one needed to flush properly the flow cell.

The flow rate must be set between 75 ml/mn and 375 ml/mn (ideal rate 166 ml/mn).

To avoid back pressure we advise atmospheric discharge.

Transmitter 9135 - pH measurement in pure water

Fig. 4.1 Measure system configuration



1	AS9 Connector
2	Temperature sensor
3	U-bolt
4	Earth terminal
5	Retaining nut for the chamber
6	Measurement chamber
7	Electrodes support
8	Sample in
9	Sample out
10	Label to record the sensor installation date
11	Flat surface for wrench

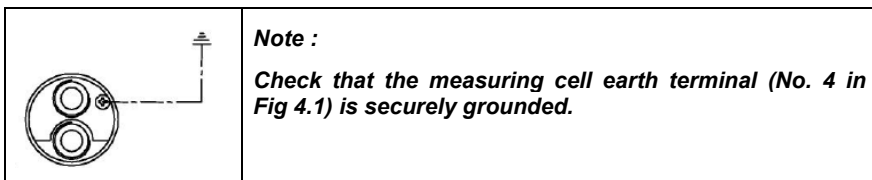
Notes :

The liquid should circulate from right to left (see drawing).

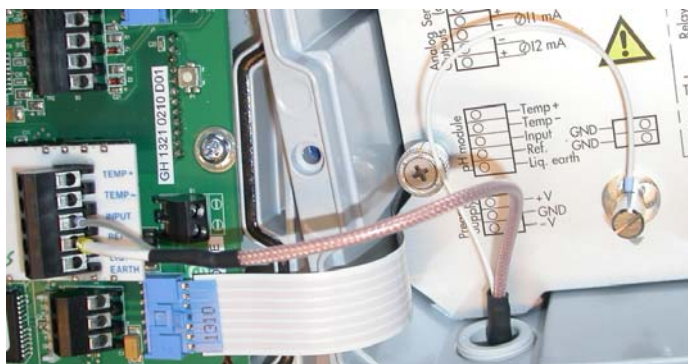
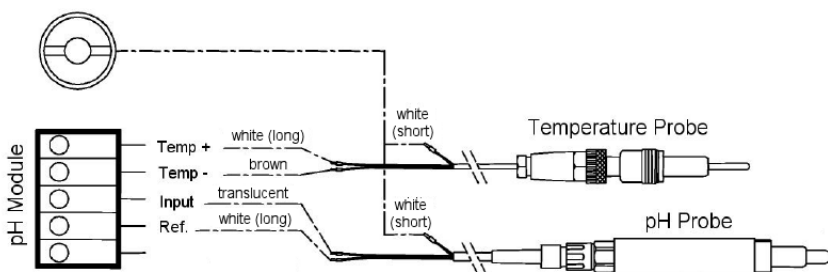
The flow chamber must be earth grounded to be protected from external electrical noise.

The flow chamber should never be empty to avoid electrode damage: keep the glass bulb in water.

Electrical connection of the measurement system (Model 8362)



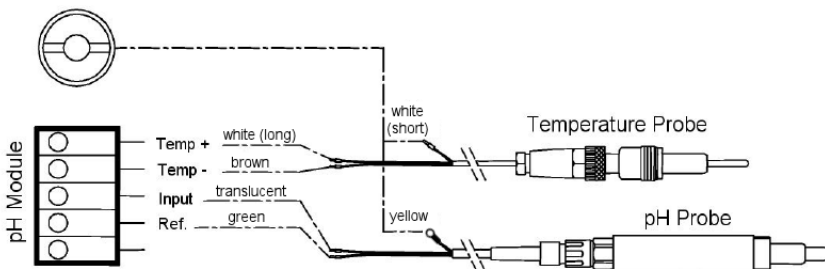
pH probe (before July 2013)



- Translucent rigid center wire = measuring pH
- White (long) internal shield = reference
- White (short) external shield = on the shield plate of the transmitter

Transmitter 9135 - pH measurement in pure water

pH probe (after July 2013)



- Translucent rigid center wire = measuring pH
- Green internal shield = reference
- Yellow external shield = on the shield plate of the transmitter

Temperature sensor

- Brown and white (long) wire = Pt100
- White (short) external shield wire = must be connected on the transmitter side of the shield plate

Note :

The protective boot filled with KCL (3M) will provide an ideal storage chamber for long periods. So this one must not be preserved during more than a year.

Never store your probe in contact with air even if it is in its flow chamber.

Transmitter 9135 - pH measurement in pure water

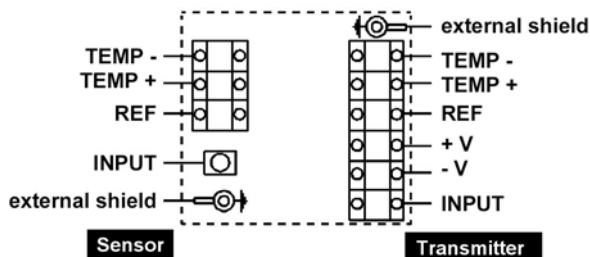
8362/9135 Links

Sensor Connections	Junction Box	Links with 9135	Distance Sensor - 9135
3, 10, or 20m (for pH and temperature sensor)	Not required	N/A	0-3, 10, or 20m
3, 10, or 20m (for pH and temperature sensor)	08350=A=8000 (see illustration below)	Low impedance cable with 6 conductors + shielding (ref: 370=506=025)	20-100m

Intermediary connection details (junctions)

WARNING: It is required to cut any wires not used.

- Connection on preamplifier 08350=A=8000



5. Using the 9135 transmitter

Utilization rules for the menus

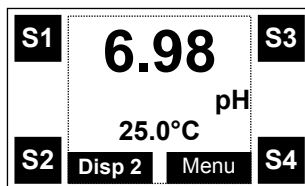
The user interface of the 9135 transmitter is made of a display screen and 4 keys.

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
Disp 3	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.



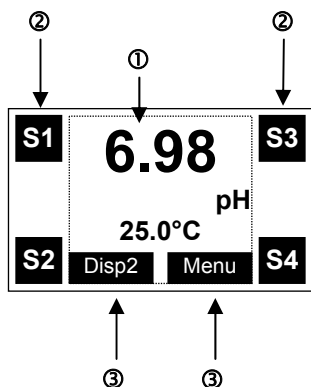
Note :

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).

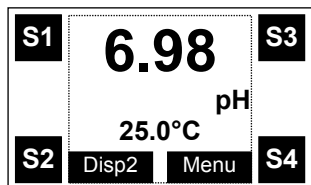
Measures display

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



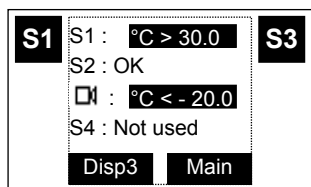
Reference	Description
①	Main display
②	Alarm state
③	Function keys

Main display



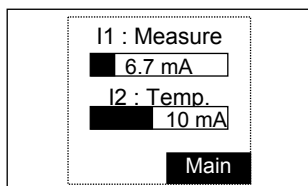
6.98 pH : pH measurement
25.0 °C : temperature measurement
S1...S4 : alarm status (invisible if alarm inactive).

Display 2



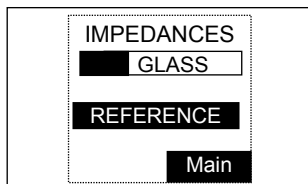
S1...S4 : alarm status
S1 : activated by a temperature > 30.0°C
S2 : inactive
☒ : S3 in alarm system
S3 closed by a temperature < - 20.0°C
S4 : not used

Display 3



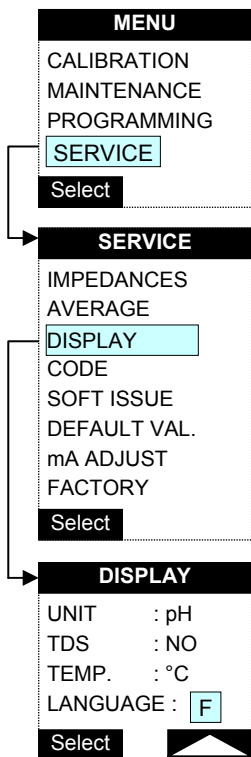
Analogue outputs allocation :
measure or temperature.
Display of each output value with a bargraph + mA indication.

Display 4



Impedance measurement of the glass and reference electrodes.
Display of a bargraph.
The bargraph limits are those user-programmed in the IMPEDANCES Menu.

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 :

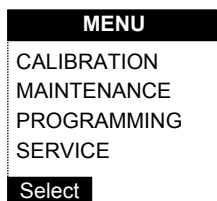
- Use the right function key **MENU**.
- Use the left function key (**Select**) to select the menu **SERVICE** and press (**Enter**).
- In the menu **SERVICE**, use the left function key (**Select**) to select **DISPLAY** and press (**Enter**).
- Select the language of your choice with the right function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

S/DISPLAY Menu

- UNIT : choice of the pH measurement unit.
 - pH
 - mV (pour le redox)
- TEMP. : choice of the temperature measurement unit.
 - °C
 - °F
- LANGUAGE : choice of the message language..
 - French,
 - English,
 - German,
 - Spanish,
 - Italian,
 - Dutch.
- Press **Esc** to go back to the DISPLAY menu.

6. Configuration of the 9135 transmitter

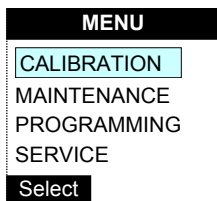
MAIN menu



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



pH calibration

In calibration mode, the temperature compensation of the electrodes occurs systematically in the temperature compensation mode according to the Nernst law. The temperature measurement remains active. If the automatic temperature compensation is selected, immerse the Pt100/1000 in the calibration solution.

Buffer solutions

The pH of buffer solutions depends on temperature, the nominal pH values are referred to a temperature of 20°C. For temperatures different from 20°C, NIST standard buffer solutions, DIN buffers, and pH values are indicated in the table below :

NIST

Temp	Buffer 4,00	Buffer 6,88	Buffer 9,00
0	4,01	6,984	9,464
5	4	6,951	9,395
10	4	6,923	9,332
15	4	6,9	9,276
20	4	6,881	9,225
25	4,01	6,865	9,18
30	4,01	6,853	9,139
35	4,02	6,844	9,102
40	4,03	6,838	9,068
45	4,04	6,834	9,038
50	4,06	6,833	9,01
55		6,833	8,985
60		6,836	8,962
65		6,84	8,941
70		6,845	8,921
75		6,852	8,902
80		6,859	8,884
85		6,867	8,867
90		6,876	8,85
95		6,886	8,833

Transmitter 9135 - pH measurement in pure water

DIN 9

Temp	Buffer 4,00	Buffer 7,00	Buffer 9,00
0	4,05	7,13	9,24
5	4,04	7,07	9,16
10	4,02	7,05	9,11
15	4,01	7,02	9,05
20	4	7	9
25	4,01	6,98	8,95
30	4,01	6,98	8,91
35	4,01	6,96	8,88
40	4,01	6,85	8,85
45	4,01	6,9	8,82
50	4,01	6,95	8,79
55	4,01	6,95	8,76
60	4,01	6,96	8,73
65	4,01	6,96	8,71
70	4,01	6,96	8,7
75	4,01	6,96	8,68
80	4,01	6,97	8,66
85	4,01	6,97	8,65
90	4,09	6,98	8,64

DIN 10

Temp	Buffer 4,00	Buffer 7,00	Buffer 10,00
0	4,05	7,13	10,26
5	4,04	7,07	10,17
10	4,02	7,05	10,11
15	4,01	7,02	10,05
20	4	7	10
25	4,01	6,98	9,94
30	4,01	6,98	9,89
35	4,01	6,96	9,84
40	4,01	6,85	9,82
45	4,01	6,9	9,78
50	4,01	6,95	9,74
55	4,01	6,95	9,7
60	4,01	6,96	9,67
65	4,01	6,96	9,65
70	4,01	6,96	9,62
75	4,01	6,96	9,58
80	4,01	6,97	9,55
85	4,01	6,97	9,52
90	4,01	6,98	9,49

The temperature of the buffer solution needs to be entered only if the transmitter is operated in the manual temperature-compensation mode.

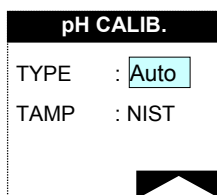
In the « automatic calibration » mode the transmitter determines the pH value according to the temperature. In the other calibration modes, the nominal pH values must always be taken into account.

For a precise calibration of the pH electrode, 2 buffer solutions are required one of which should have a pH close to the sample pH. The pH 7 buffer solution (or 6.88 à 25°C)) is required for a first standardization and a pH 4 buffer solution (or 4.01 to 25°C) or pH 10 (or 9.22 to 25°C) is required to calibrate the electrode slope.

Choice of the calibration type

Different calibration types may be selected. In the CALIBRATION menu :

- Press CHOICE to select pH standard.
- Press **Enter**.
- Press CHOICE to select PROGRAMMING.
- With the right function key, choose the calibration type.



Automatic calibration

With the right function key, select the buffer type you use so that the instrument determines precisely the buffer value according to the temperature.

You have the choice between three tables : NIST, DIN 9, DIN 10 which corresponds to the standard buffer values whose value varies according to the temperature as indicated in the previous chapter dedicated to the buffer solutions.

Transmitter 9135 - pH measurement in pure water

The user calibrates the pH measurement with 2 of the 3 standard buffers from the table chosen :

- NIST : 4.00, 6.88, 9.22
- DIN 9 : 4.00, 7.00, 9.00
- DIN 10 : 4.00, 7.00, 10.00

The user does not enter any value during calibration.

pH CALIB.	
TYPE :	2pts
BUF1 :	3.75 pH
BUF2 :	8.05 pH
Select	

2 point calibration

Calibration type used when the user has no standard buffer (4.00/6.88/9.22). The buffer value remains the same to a constant temperature and the user enters them only one time when he programs the calibration.

pH CALIB.	
TYPE :	Process
	

Process calibration

Note :

Warning ! This calibration is only active on the zero shift.

The user calibrates on one point using 1 buffer or the sample to measure. The user needs to enter the buffer or sample value for each calibration.

pH CALIB.	
TYPE :	Valeurs
SLOPE :	102 %
OFFSET :	00.12 pH
Select	

Values calibration

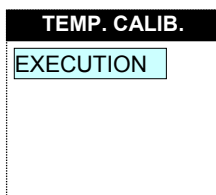
The user has calibrated his electrodes in the laboratory. He programs the slope and zero values (% of 59.16 mV/pH) he has measured in the laboratory.

Slope and offset limits

An error message is displayed if the slope is not in-between [70 %, 120 % or offset in-between [-3 pH, + 3 pH].

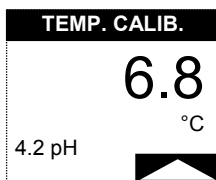
See Chapter error messages and Troubleshooting.

Transmitter 9135 - pH measurement in pure water

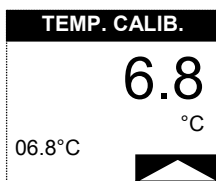


Temperature calibration

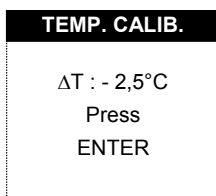
To reach the temperature calibration screen, press the EXECUTION mode with ENTER.



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



You can change the temperature value since the screen.



Display of motion.

Note :

The temperature adjustment limits are between - 50°C et + 20°C.

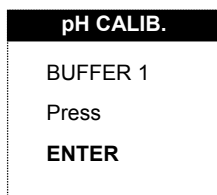
Calibration proceedings example

Manual calibration, automatic temperature compensation mode

Proceed as follows (refer also to Fig 6.1 on page 37):

- Stop circulation of the sample.

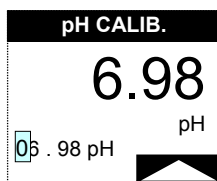
Buffer 1



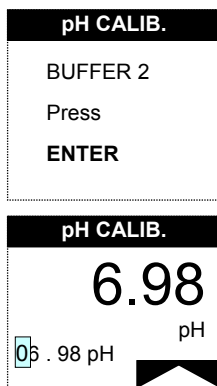
- Maintain the screw nut in position and unscrew the chamber (A).
- Empty out the water contained in the chamber, and rinse with demineralised water.
- Refill with a fresh buffer (B) pH 7.00 (or 6.88 at 25°C), re-screw the nut (C).
- Validate by **Enter**.
- No calibrated pH measure is displayed.
- Press OK when the measure is constant.

Note :

Press ESC to quit the calibration.



- The temperature indication disappears and the pH measure appears.
- The measured temperature by means of the 8362 temperature probe system allows to adjust the value of the buffer solution.
- Utilize the  to change a digit and press **Enter**. Press directly **Enter** to not change a digit.
- After the last number, press **Enter** to validate the calibration.



Buffer 2

- Maintain the screw nut in position and unscrew the chamber (A).
- Empty out the water contained in the chamber, and rinse with demineralised water.
- Refill with a fresh buffer (B) pH 9.00, re-screw the nut (C).
- Validate by **Enter**.
- The temperature indication disappears and the pH measure appears.
- The measured temperature by means of the 8362 temperature probe system allows to adjust the value of the reference solution.
- Utilize the  to change a digit and press **Enter**. Press directly **Enter** to not change a digit.
- After the last number, press **Enter** to validate the calibration.
- Calibration parameters are displayed.
- Put the calibration date.
Press on  to select the first digit.
Utilize  to change a digit and validate by **Enter**.
- Press **Enter** after validation of the last digit of the year. Press another time **Enter** to validate the calibration parameters.

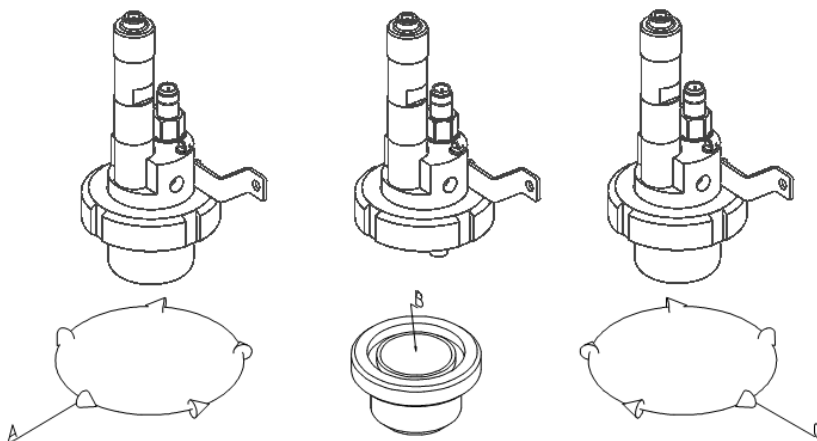
Note :

If you quit with out validate the calibration parameters, the transmitter will set the last calibration and not yours.

Transmitter 9135 - pH measurement in pure water

- Maintain the screw nut in position and unscrew the chamber (A).
- Empty out the water contained in the chamber, and rinse with demineralised water.
- Rinse carefully the electrodes with demineralised water.
- Put the chamber (A) in position with the imperviousness flange.
- Regenerate the circulation of the sample to his nominal flow. Wait 30 minutes before measuring the real pH value.

Fig. 6.1 Calibration of the measure system



PARAMETERS Menu

PARAMETERS	
DATE	: 26/03/96
SLOPE	: 95%
ZERO	: 0,3 pH
ΔT	: 0,2°C

The date, slope and zero of the last calibration may be displayed in the PARAMETERS menu.

HISTORIC Menu

HISTORIC	
DATE	: 26/03/96
SLOPE	: 98%
ZERO	: -0,3 pH
Select.	

The slope and zero parameters of the last two calibrations may be displayed in the historic menu.

Press the left function key SELECT to display the next parameters.

MAINTENANCE Menu

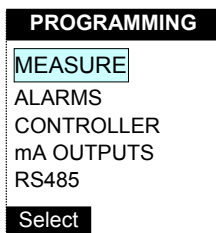
MAINTENANCE	
6.98	
pH	
26.4 °C	

When changing an electrode or servicing the instrument, the transmitter continues to display measures.

Note :

The analogue output value is the value programmed in the mA menu. The relay state 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.

Transmitter 9135 - pH measurement in pure water

MEASURE

ELECTRODE

TEMP. COMP. :

Select

S/MEASURE Menu

ELECTRODE menu allows to set up the electrode model.

COMP. TEMP menu allows to set up the temperature compensation.

ELECTRODE

TYPE : Other

ISO Pt : 1,5 pH

SLOPE : 95 %

Uiso : 200 mV



ELECTRODE

Choice of the electrode.

- TYPE** :
- Glass
 - Sb
 - Redox
 - Other

ISO Pt : XX,XX pH

The isothermal point corresponds to the pH value which does not vary according to the temperature.

SLOPE : XX %

Indication of the electrode sensitivity in % of the theoretic value (59,16 mV/pH at 25°C).

Uiso : XXXX mV

Uiso is the potential of the isothermal point.

Transmitter 9135 - pH measurement in pure water

TEMP. COMP.	
MAESURE :	Yes
TYPE :	Manual
TEMP. :	20°C
COMP. :	Coeff.
Δ. :	00.010 pH
Select	

TEMP. COMP.

This menu allows to set up the temperature compensation.

MEASURE: - No Choice of a temperature measurement with or without Pt100 / Pt1000.
 - Pt

TYPE : - Auto. Choice between an automatic or a manual temperature measurement.
 - Manual

TEMP. : XX °C Possibility to enter the sample temperature in a manual compensation.

COMP. : Choice of the temperature compensation type :
 - NERNST - linear compensation (0.1984 mV/°C).

 - Pure - compensation according to the ultrapure water curve.

 - Matrix 1 - compensation according to the sulphate curve (4.84 mg/l corresponds to a pH 4.0 to 25°C).

 - Matrix 2 - compensation according to the ammoniac/hydrazine curve (0.272 mg/l ammoniac + 20 µg/l corresponds to a pH 9.0 to 25°C).

 - Matrix 3 - compensation according to the ammoniac / morpholine / hydrazine curve (1.832 mg/l ammoniac + 10 mg/l morpholine + 50 µg/l hydrazine corresponds to a pH 9.6 to 25°C).

 - Matrix 4 - compensation according to the phosphate curve (3 mg/l phosphates + 0.3 mg/l ammoniac).

 Coeff. - ajustable coefficient (pH/10°C).

Δ : XX In the case of a programmable coefficient, possibility to enter the value of the coefficient (value in pH/10°C or pH/18°F).

mA OUTPUTS

OUTPUT 1
OUTPUT 2
SPECIAL PROG.
TEST

Select

OUTPUT 1/2

AFFECT. : pH
TYPE : 0/20 mA
LOWER : 10.0 mS
UPPER : 20.0 mS

Select

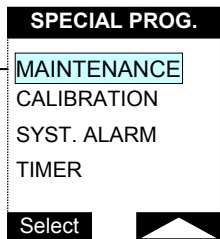


S/mA OUTPUTS Menu

This menu allows to adjust analogue outputs.

OUTPUT 1/2

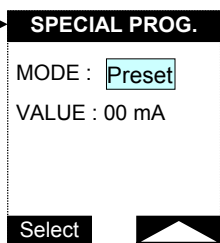
- AFFECT. : choice if the analogue output allocated to measure or temperature.
 - pH/mV
 - °C/°F
- TYPE : choice of the analogue output type.
 - 0/20 mA
 - 4/20 mA
- LOWER : lower limit value programming.
- UPPER : upper limit value programming.



S/SPECIAL PROG. Menu

This screen allow to adjust 4.20 mA outputs states in special events :

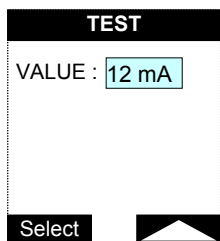
- MAINTENANCE
- CALIBRATION
- SYST. ALARM
- TIMER



- MODE : choice of a preset value during calibration, alarm system or maintenance.

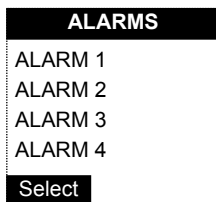
- last
- preset
- live

- VALUE: indication of the preset value 0 to 21 mA.



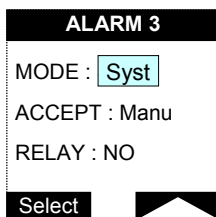
TEST

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



S/ALARMS Menu

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

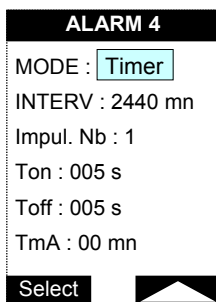


The MODE parameter allows to choose the operating mode of the 4 alarms :

- Lim : alarms 1...4
- System : only alarm 3
- Timer : only alarm 4

MODE :

- No
- Lim
- Syst
- Timer



Transmitter 9135 - pH measurement in pure water

ALARM 1

AFFECT. : °C/°F

LIMIT : 20.3°C

DIR : Up

DELAY : 30s

HYST. : 10%

RELAY : NO

Select 

ALARM 2

AFFECT. : NO

Select 

ALARM 1/2 (limit)

- AFFECT. : choice of a limit on the measure or the temperature.
 - no
 - pH/mV
 - °C/°F
- LIMIT : value of the limit.
- DIR : choice of the direction
 - Up
 - Down
- DELAY : definition of the temporization when the relay interlocking in seconde.
- HYST : definition of the limit hysteresis thresholds on % (10% max).
- RELAY : choice of the relays normally open or closed.
 - NO
 - NF

ALARM 3

MODE : **Syst**

ACCEPT. : Manu

RELAY : NO

Select 

ALARM 3 (Alarm system)

- Choice of a limit on the measure or alarm system with alarm 3.

MODE :

- No
- Limit
- Syst.

- Manual or automatic acquit possible with the alarm system.

ACCEPT :

- Auto
- Manu

- Choice between relays normally open or closed.

RELAY :

- NO
- NC

ALARM 4

MODE : **Timer**

INTERV : 2440 mn

Impul. Nb : 1

Ton : 005 s

Toff : 005 s

TmA : 00 mn

Select 

ALARM 4 (Timer)

- Choice between a limit on the measure or a timer for the probe cleaning with alarm 4.

MODE :

- No
- Seuil
- Timer

- INTERV : interval between 2 cleaning cycles in minutes.

- IMPUL. Nb : number of pulses during a cleaning cycle.

- Ton : time when relay is activated, in secondes.

- Toff : time when relay is deactivated, in secondes.

- TmA : analog output hold time for the analogue outputs in minutes.

S/CONTROLLER Menu

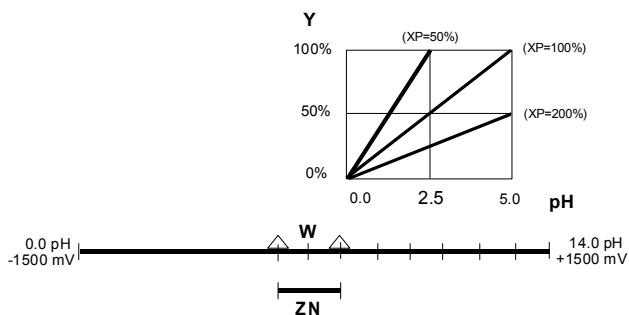
The built-in proportional controller, abbreviation controller P. The controller output Y activates the limit switch relays. Y value may correspond to a control by impulse or a control by frequency. The Y value is determined by the parameters below :

- A setpoint (**W**) : corresponds to the pH value to control.
- Within this neutral band the control element (valve, dosing pump) is always inactive.
- A proportional band (**XP**) : represents the regulation slope. A XP value equal to 100% is defined as a Y controlling value of 100% for a 5 pH (or 1000 V in redox) drift according to the neutral zone extremity.
- A power factor (**Exponent**) : which calculates a controlling value from a lineary (exponent = 1) or an exponential function.

The value of Y in pH corresponds to the equation below :

$$Y = \frac{100}{XP} * \frac{[pH - (W + \frac{ZN}{2})]^{\text{Exponent}}}{5}$$

Y value is represented as follows :



CONTROLLER

CNTRLLR : Yes
MODE : Freq.
POINT : 7.00 pH
NEUT. Z. : 2.0 pH
INERTIA : 000 s
CTL. TIME : 20 mn
RELAY S1
RELAY S2
MANUAL MODE

Select

Different controller modes are available. They enable a frequency, a pulse or a mixed pulse/frequency control. Relay S1 (base injection) and relay S2 (acid injection) ensure the control. The controller parameters are programmable via the programming variables below.

CONTROLLER

- Choice to use an integrated controller :
CNTRLLR : • Yes
 • No
- Choice of the control mode :
MODE : • Pulse S1 & S2 in pulse control
 • Freq. S1 & S2 in frequency control
 • Pul./Frq. S1 in pulse control /S2 in frequency control
 • Frq./Pul. S1 in frequency control /S2 in pulse control
- Value of the setpoint :
POINT : XXXX - In pH or mV
- Neutral zone range : zone around the setpoint where the regulation is not activated
NEUT Z. : XXX - In pH or mV
- Reaction time after activating relays S1 or S2 : delay time after executing the next period.
INERTIA : XXX – In s
- Maximum time out of the neutral zone .After this period and without returning into the neutral zone, the system alarm “control too long” is activated.
CTL. TIME : XX – In mn

Transmitter 9135 - pH measurement in pure water

Note :

Any default detected by the transmitter stops the controller function.

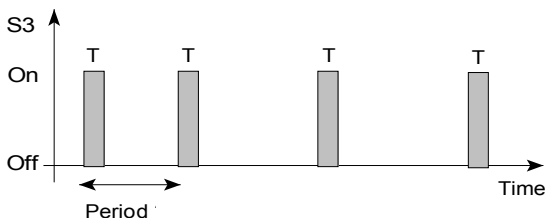
The default "CONTROL TOO LONG" should be manually released by pressing ENTER.

If the TIMER and CONTROLLER functions are activated at the same time, the controller is stopped during the timer cycle.

Any cycle calculated by the transmitter is carried out to the end.

FREQUENCY CONTROL :

The pulse width is constant and programmable (0.1 to 0.7 s). The pulse period varies according to the sample pH value.



RELAY S1

COEF.XP1 : 100%
T1 : 2.00 s
MIN : 001 i/min
MAX : 200 i/min

Select

RELAY S2

COEF.XP2 : 100%
T2 : 2.00 s
MIN : 001 i/min
MAX : 200 i/min

Select

MANUAL MODE

7.00
pH

25.0 °C

S1

S2

S1 & S2 RELAYS

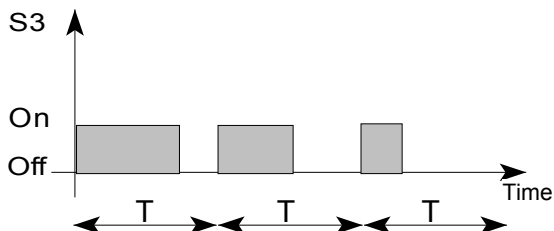
- Proportionality coefficient : slope of regulation :
COEF.XP1/2 : XXX – In %
- Value of the pulse width ($0,1 < T < 0,7$) :
T1/2 : XXX – In %
- Minimum number of pulses per minute. Program this value according to the control system associated to the relay :
MIN : XXX – In i/min
- Maximum number of pulses per minute. Program this value according to the control system associated to the relay :
MAX : XXX – In i/min

MANUAL MODE

- Force relay S1 or S2. Pressing the function key associated to the relay, the relay is activated till you release the key. The corresponding icon is displayed according to the relay state.

PULSE CONTROL :

The pulse period is constant and programmable (3 to 60 s). It is the cycle quotient (α) which varies according to the sample pH value.



CONTROLLER

CNTRLR : Yes

MODE : Pulse

POINT : 7.00 pH

NEUT Z. : 2.0 pH

INERTIA : 000 s

CTL TIME : 20 mn

RELAY S1

RELAY S2

MANUAL MODE

Select

RELAY S1

COEF.XP1 : 100%

T1 : 2.00 s

S1 MIN : 1.0 s

EXPONENT : 01.0

Select

RELAY S2

COEF.XP2 : 100%

T2 : 2.00 s

S2 MIN : 1.0 s

EXPONENT : 01.0

Select

CONTROLLER

- Regulation form select

MODE : Pulse

S1 & S2 RELAYS

- Value of the pulse period ($3 < T < 60$) :

T1/2 : XXX In s

- Minimum activation time of the relay :

S1/2 MIN : XXX In s

- Value of the power factor. In the case of a non-linear calculation of the control value, modify the exponent value. This modification allows a greater correction of the measurement when it is far from the setpoint.

"PULSE/FREQUENCY" CONTROL OR "FREQUENCY/PULSE" CONTROL

The controller may be programmed in a mixed mode. Use the Mode command for the programming. See paragraphs concerning the frequency control and the pulse control to program the relay S1 and S2.

Transmitter 9135 - pH measurement in pure water

RS485

N° : 4
BAUD : 9600
PARITY : Odd
STOP BIT : 1
WORD invs. : YES

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

PARITY - Without parity bit : No
 - With odd parity bit : Odd
 - With even parity bit : Even

STOP BIT - 1 bit stop
 - 2 bits stop

SWAP WORD - Allow to reverse the "strong weight",
"light weight" size during the
manipulation of the ceal variable
(float type). Some equipments need
this reverse to read correctly the teal
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	
IMPEDANCES	
AVERAGE	
DISPLAY	
CODE	
SOFT ISSUE	
DEFAULT VAL	
mA ADJUST	
FACTORY	
Select	

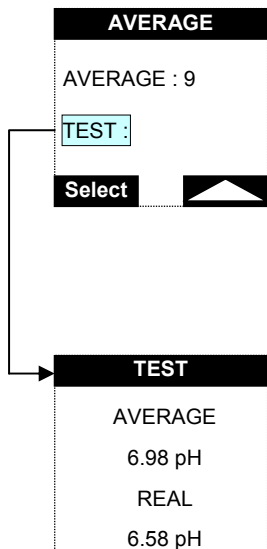
Note :

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

This screen allows to reach the 9135 transmitter configuration screens.

The display options are detailed page 28.

Transmitter 9135 - pH measurement in pure water



S/AVERAGE Menu

Program a sliding average on the pH/redox 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/DISPLAY Menu

This menu options are describes in page 28 of this manual.

Transmitter 9135 - pH measurement in pure water

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

S/CODE Menu

- CALIB. : access code for "temperature and pH 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.

Transmitter 9135 - pH measurement in pure water

VERSION

MONEC 9135

pH X.XX

S/SOFT ISSUE Menu

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

DEFAULT/VAL.

Loading



values

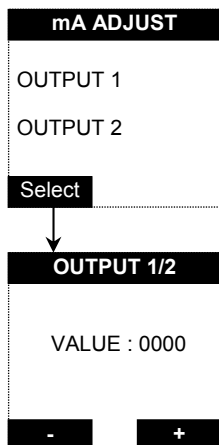
default ?

Yes

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.

7. Failures detection and error messages

Failures detection

Symptom	Possible cause	Remedy
Reading out of scale	Faulty transmitter	Check the transmitter by connecting a pH simulator or a voltage generator instead of the electrode
	Faulty electrode	Check the electrode operation with buffer solutions
	Electrode not correctly connected	Check the connections
	Bubbles in the bulb	Remove the electrode, shake it and put it back
Unstable display	Faulty transmitter	Check the transmitter by connecting a pH simulator or a voltage generator instead of the electrode
	Solution not earth grounded	Connect the electrode
	Bubbles on the pH bulb	Remove the electrode, shake it and put it back
Slow drift	PH bulb polluted	See cleaning instructions
	Reference clogged	See cleaning instructions
Low slope or slow response	Buffers polluted	Use new buffers
	PH bulb polluted	See cleaning instructions
	Reference clogged	See cleaning instructions
	Faulty electrode	Check the electrode operation

Electrode cleaning

Electrodes which are mechanically undamaged, without any broken part, may be regenerated according to the instructions below :

Salt deposits: Dissolve the deposit by immersing the electrode in 0.1 M from HCL during 5 minutes, following by an immersion of 5 minutes in a 0.1 M of NaOH and rinse abundantly with demineralised water.

Grease/Oil : Clean the electrode bulb with detergent and water. Rinse the extremity of the electrode with demineralised water.

Reference electrode junction clogged : Heat a KCL solution diluted to 60-80°C. Place the clogged part in the hot solution during 10 minutes. Cool the electrode in a cold KCL solution.

If these advice do not ensure a normal response time, change the electrode.

Maintenance

No particular maintenance required. Clean the instrument with a soft tissue and without any aggressive agent.

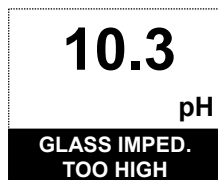
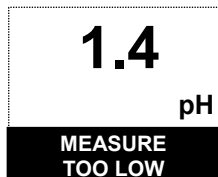
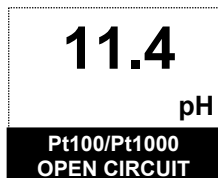
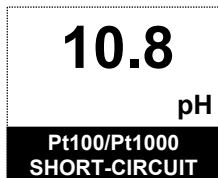
Error messages

Note :

In manual acquittal, to suppress an error message press ENTER after correcting the default.

Transmitter 9135 - pH measurement in pure water

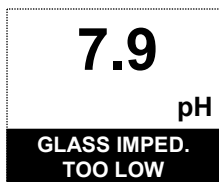
ERROR MESSAGE



DESCRIPTION/POSSIBLE CAUSE

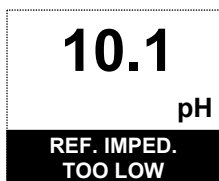
- Sensor not correctly connected.
Temperature sensor damaged
Replace it if necessary.
- Sensor not correctly connected.
Temperature sensor damaged
Replace it if necessary.
- The pH value is inferior to - 3 pH.
- The pH value is superior to 14 pH.
- The glass electrode impedance is superior to the limits set by the user. It is required to :
 - change the limits or,
 - clean or change the clogged electrode.

Transmitter 9135 - pH measurement in pure water



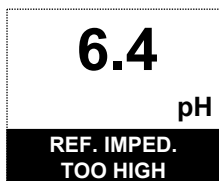
The glass electrode impedance is inferior to the limits set by the user. It is required to :

- change the limits or,
- change the broken electrode.



The reference electrode impedance is inferior to the limits set by the user. It is required to :

- change the limits or,
- change the damaged electrode.



The reference electrode impedance is superior to the limits set by the user. It is required to :

- change the limits or,
- clean the clogged electrode or change the poisoned electrode.



The time out of the neutral zone is superior to the limit programmed by the user. It is required to :

- change the limits or,
- check the relays S1 and S2.

Transmitter 9135 - pH measurement in pure water

ERROR MESSAGES DURING A CALIBRATION NOTE : Press ESC to leave the menu and calibrate again.	
PH CALIB. SLOPE : 99,9% ZERO : 4.00 pH OFFSET OUT OF LIMITS	The zero shift is superior to the limit programmed. <u>Limits :</u> - <u>pH calibration : 3 pH</u> - <u>redox calibration : 250 mV</u>
PH CALIB. SLOPE : 130% ZERO : 0.1 pH SLOPE OUT OF LIMITS	The slope shift is superior to the limit programmed. <u>Limits : 70...120 %</u>
PH CALIB. ΔT : +25.0°C ΔT OUT OF LIMITS	The temperature drift is superior to the limit programmed. <u>Limits : - 50°C/ +20°C</u>

8. Analogue outputs and temperature control

Analogue outputs control

An external socket from the transmitter (for certain versions) fixed on the lower part of the front panel allows to measure the value of the analogue output current by inserting a miliampere-meter in the current loop.

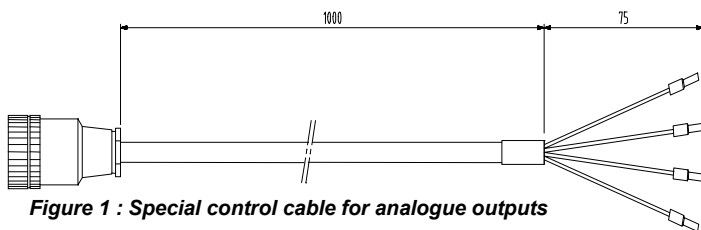


Figure 1 : Special control cable for analogue outputs

A special cable (figure 1, Ref : 09125=A=8010), provided as an option, gives access, when connected, to the following signals :

I1+ : brown flex

I1- : yellow flex

I2+ : white flex

I2- : green flex

Reading in mA between the yellow and brown wires gives the current value of **output 1**.

Reading in mA between the white and green wires gives the current value of **output 2**.

Pt100 simulator connections

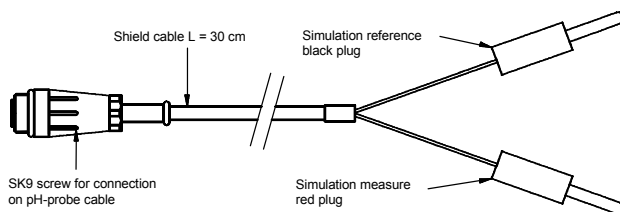
The transmitter can be connected to a Pt100 simulator by means of the cable (Ref : 09125=A=8010) :

Temp + : white flex

Temp - : yellow flex

pH simulator connections

pH simulator can be connected to the electrode connection cable by means of another cable (Ref : 09135=A=8030).



Glass electrode input : red plug

Reference input : black plug

Appendix A : Default values

CALIBRATION

pH CALIB.

TYPE : Auto

PARAMETERS

DATE : 01/01/01

SLOPE : 100.0%

OFFSET : 0.00 pH

ΔT : 0.0 °C

PROGRAMMING

MEASURE

ELECTRODE

TYPE : Glass

TEMP.COMP.

MEASURE : No

TEMP. : 25°C

COMP. : Nernst

ALARMS

ALARMS S1...S4

AFFECT. : pH

LIMIT : 0.00 pH

DIR. : Bas

DELAY. : 000 s

HYST. : 00%

RELAY : NO

mA OUTPUTS

OUTPUT 1

AFFECT. : pH

TYPE : 4-20

LOWER : 00.00 pH

UPPER : 14.00 pH

OUTPUT 2

AFFECT. : pH

TYPE : 4-20

LOWER : 00.00 pH

UPPER : 14.00 pH

SPECIAL PROG.

MAINTENANCE

MODE : Last

CALIBRATION

MODE : Last

TIMER

MODE : Last

SYST. ALARM

MODE : Last

Transmitter 9135 - pH measurement in pure water

RS485

No : 1
BAUD : 19200
PARITY : No
STOP BIT : 1
WORD invs. : YES
NO

SERVICE

IMPEDANCES

FREQUENCE : 24.0 H

GLASS

GLASS : No

REFERENCE

REFERENCE : No

AVERAGE

AVERAGE : 0

DISPLAY

DISPLAY

RES. : 0.01 pH

UNIT : °C

LANGUAGE : GB

CODE

CODE

CALIB. : 0000

PROG. : 0000

SERVICE : 0000

Appendix B : Spare parts list

Any other spare parts except those below in the table should be replaced in the instrument.

Part number	Description
09125=A=1001	9135 equipped CPU board
09135=A=1500	9135 complete pH module
09125=A=2000	9135 power supply (standard version)
09125=A=2020	9135 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=002	Shutter PG 11 for P.E
425=110=221	Cable gland PG 11
425=130=002	Shutter PG 13,5 for P.E
425=135=222	Cable gland PG 13,5
428=112=025	Gasket 11.2 x 2.55 mm (EPDM) for 8361/8362 pH probes
429=600=400	Gasket DN40 (EPDM) for 8362 pH probe
351=007=001	Strap FLEXPAC 7 PTS
621=083=062	French instruction manual
621=991=000	JBUS/MODBUS communication manual
08362=A=2000	pH electrode
359016,10110	pH electrode's 3 m cable
359016,10120	pH electrode's 10 m cable
359016,10122	pH electrode's 20 m cable

Transmitter 9135 - pH measurement in pure water

09125=A=8010	Pt100/1000's simulator connections cable
09135=A=8030	Low impedance pH's simulator connections cable
08362=A=1001	Pt100's temperature sensor
08362=A=3001	Pt100's 3 m cable
08362=A=3002	Pt100's 10 m cable
08362=A=3003	Pt100's 20 m cable
08362=A=4000	2 connections (1/8" NPT, for 6 mm outer diameter tube)
363130, 00500	pH 4 solution (500 ml)
363131, 00500	pH 6.88 solution (500 ml)
363132, 00500	pH 9.22 solution (500 ml)

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