

BAMOPHOX 106 E - M

pH/mV meter



INSTRUCTION MANUAL

BAMO MESURES

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pH/mV meter
BAMOPHOX 106

106 M1 01 D

MES

106-01/1

pH/mV meter BAMOPHOX 106

(Technical information and Manual for LOGGER /RS422 version are on a specific document)

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1. TECHNICAL FEATURES

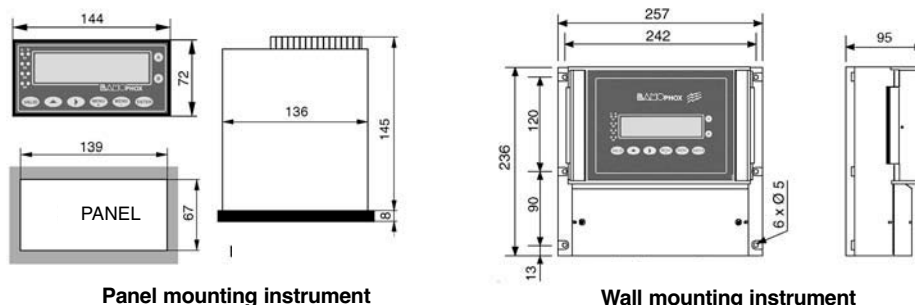
Displayed parameters:	Measurement values pH/ORP - Configuration Menu - Temperature value
Display:	Back lighted - 2 lines of 16 alphanumerical characters ; 9,2 mm high
Indication:	LED alarms status
Configuration:	8 push buttons keyboard on front face - Keyword protected
Scales:	0 to 14 pH pH-meter configuration / ± 1000 mV ORP-meter configuration
Accuracy:	$\pm 0,03$ pH or ± 3 mV
Input impedance:	$>10^{13} \Omega$
Probe input:	coaxial connector, code 9054
Temperature compensation:	Automatic with an input for a 3 wires Pt 100 Ohm/0°C range, 0...100°C Manually from 0...100°C
Relay outputs:	4 closing contacts (Silver alloy), voltage free
Thresholds:	3 programmable independent thresholds - with adjustable hysteresis 0...100% - and adjustable timer from 0 to 9999 sec
Output relay (S4)	Common alarm signal for: - Too long injection - Temperature out of range: - pH>14 or open loop - Pt 100 Ω dysfunction or probe cleaning function
Contact:	Initial resistance 100 m Ω as a maximum (voltage drop 6 V DC 1 A) Rated at 831 V AC / 3 A / 277 V AC ; 90 W / 3 A / 30 V DC Switching capacity (minimum) 100 mA, 5 V DC (depending of switching frequency, ambient conditions, accuracy) Mechanical life time (minimum) 5 x10 ⁶ operations (180 commutation/min) Electrical life time (minimum) 2 x10 ⁵ (20 comm./min) [3 A, 125 V AC], [3 A, 30 V DC] and 10 ⁵ (evaluated charge) for 3 A, 125 V AC
ON/OFF Regulation:	Pulse time 0...9999 sec - High and low proportional bandwidth, high and low dead zone.
PID Regulation:	Proportionality 0...200%, - Integrant and Derivative: 0...999 second
Calibration sequence:	Regulation on standby, relay outputs inhibited, analogical outputs stand on last values
Self-cleaning program:	Frequency and duration settings, with regulation inhibited and analogical outputs standing on last values
Measurement output:	0/4-20 mA (maxi 600 Ω) proportional to measurement, galvanic insulated
Temperature output / PID:	0/4-20 mA (max 600 Ω), scaling 0...100°C, galvanic insulated
Program Testing:	simulation through the menu on measurement, temperature, PID and relays outputs
Main power supply:	230 V AC / 50-60 Hz [other on request] - Consumption 10 VA
Models:	Panel mounting, IP65, 72 x 144 mm, connections on screw terminal IP40 Idem DIN Rail mounting, only for blind monitor Wall mounting, IP65, cable glands, connections on screw terminal

OPTION (RS 422 + Logger)

Communication:	RS422 output, J-BUS link, binary slave mode, 2400 to 9600 bauds
Data Logger:	Cycle average measurement record, with a programmable period, 150000 records maxi on MMC (multi media card) / External driver necessary

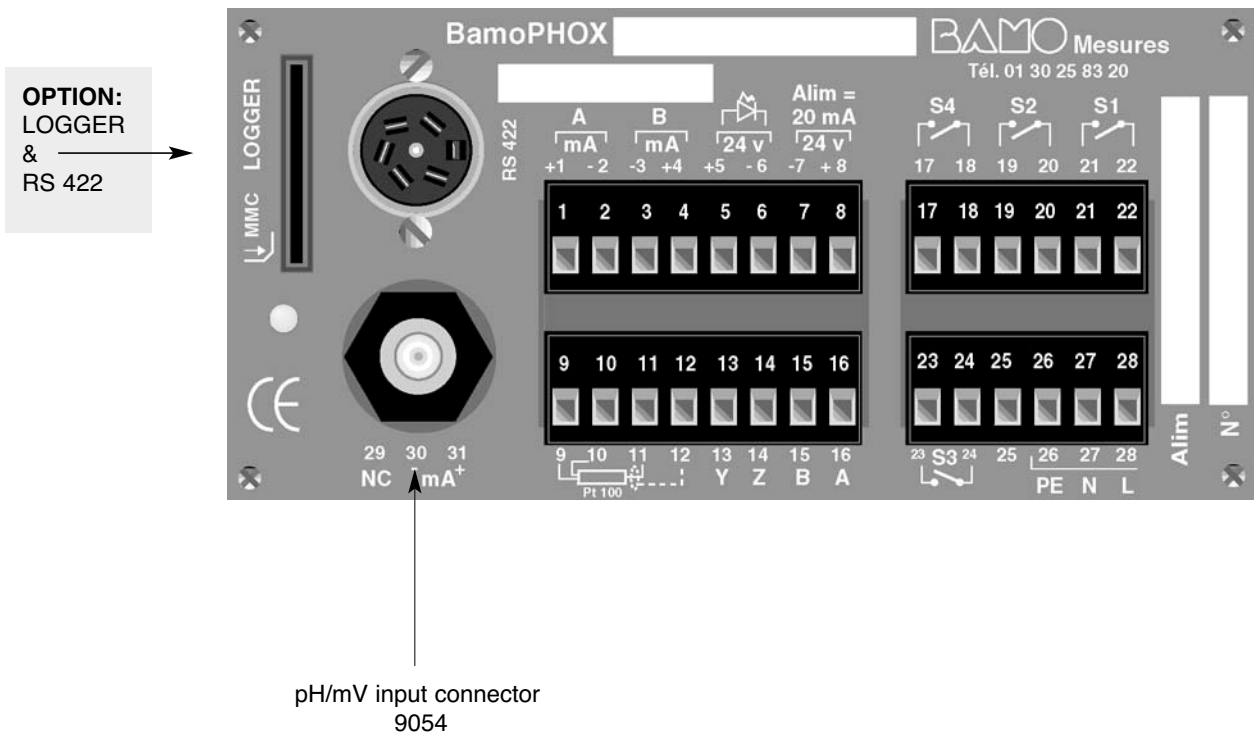
2. DIMENSIONS

Extension terminal:
identical to the panel
or wall mounting

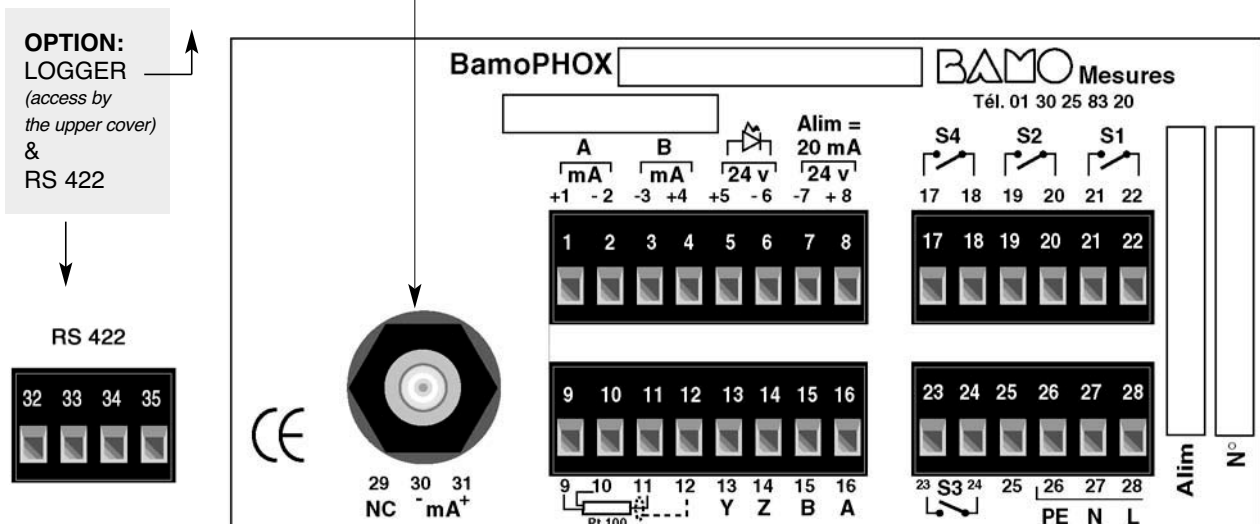


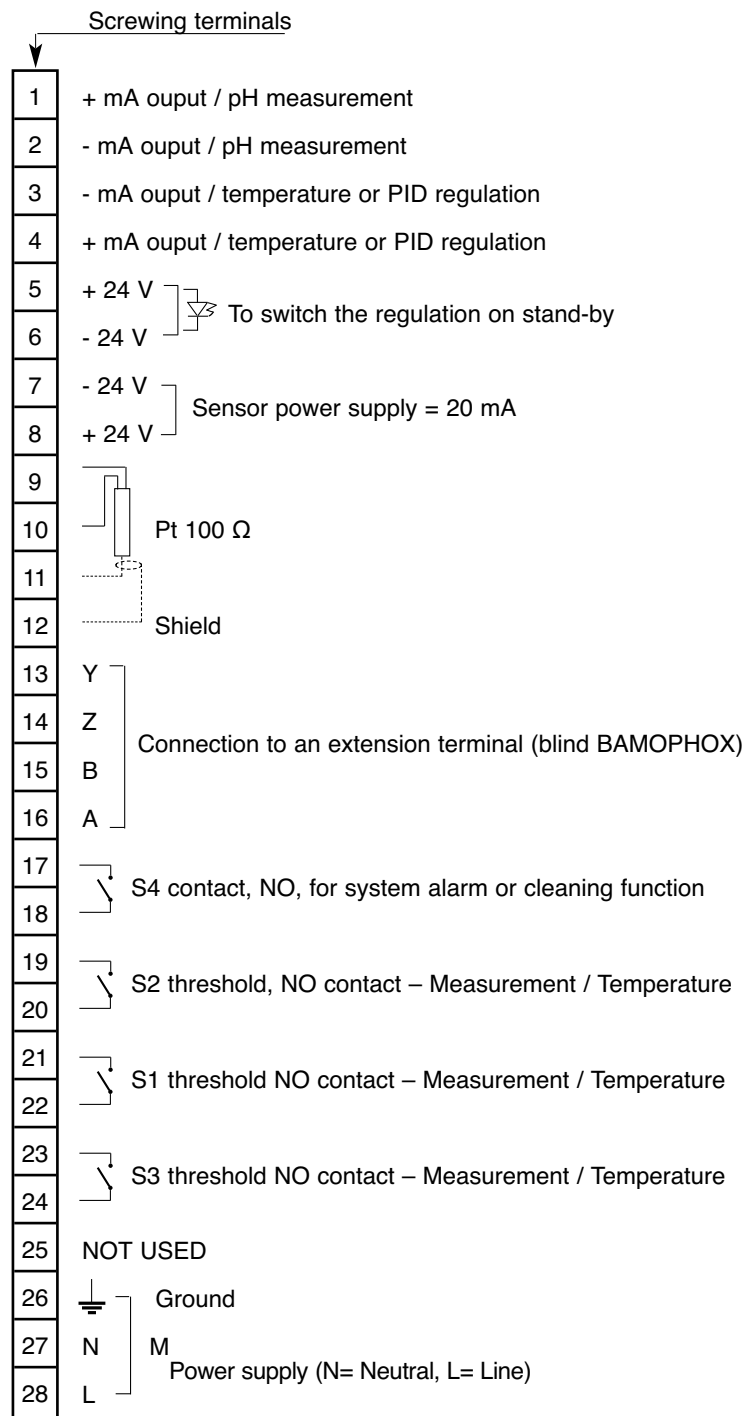
3. WIRING

PANEL MOUNTING

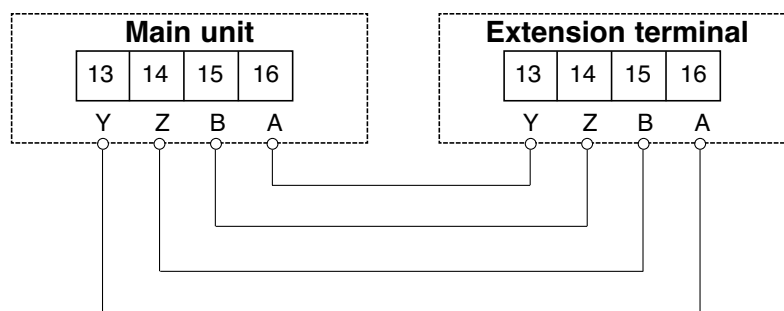


WALL MOUNTING





Wiring from wall or panel mounting BAMOPHOX to an Extension terminal BAMOPHOX



- Maximum length cable
500 m

- Wire specifications:
Mains cable or 4 wires shielded cable
 $\geq 0,25 \text{ mm}^2$ cross section

4. FRONT PANEL

S1, S2, S3, and S4

indicate relays status:

LED lighting = contact ON

LED OFF = contact OFF

LED flashing = Timer in use

2 lines /16 alphanumeric characters
9.22 mm high - Back lighted

Key "A"

To display the parameters of upper line.
(main BAMOPHOX)

Key "B"

To display the parameters of lower line.
(Extension blind BAMOPHOX)



"VALID" key

To save the parameters on EPROM
when it asks:

VALIDATION ?

Caution, when you press this key,
all parameters are saved.

(previous data programmation
will be overwritten).

If you are not sure of any modification,
do not press the VALID key,

To change parameters of data capture:

Numeric input increase the
flashing digit (loop 0 after 9).

Reverse the choice Yes / No,
Up/Down, 0-20 mA / 4-20 mA etc.

To go to the next display or to change a value.

"ENTER" key

To change the step displayed menu.
At the last step, it comes back to the
first line.

"MENU -" key

To move the cursor during configuration.
At the last digit, comes back on the first one.

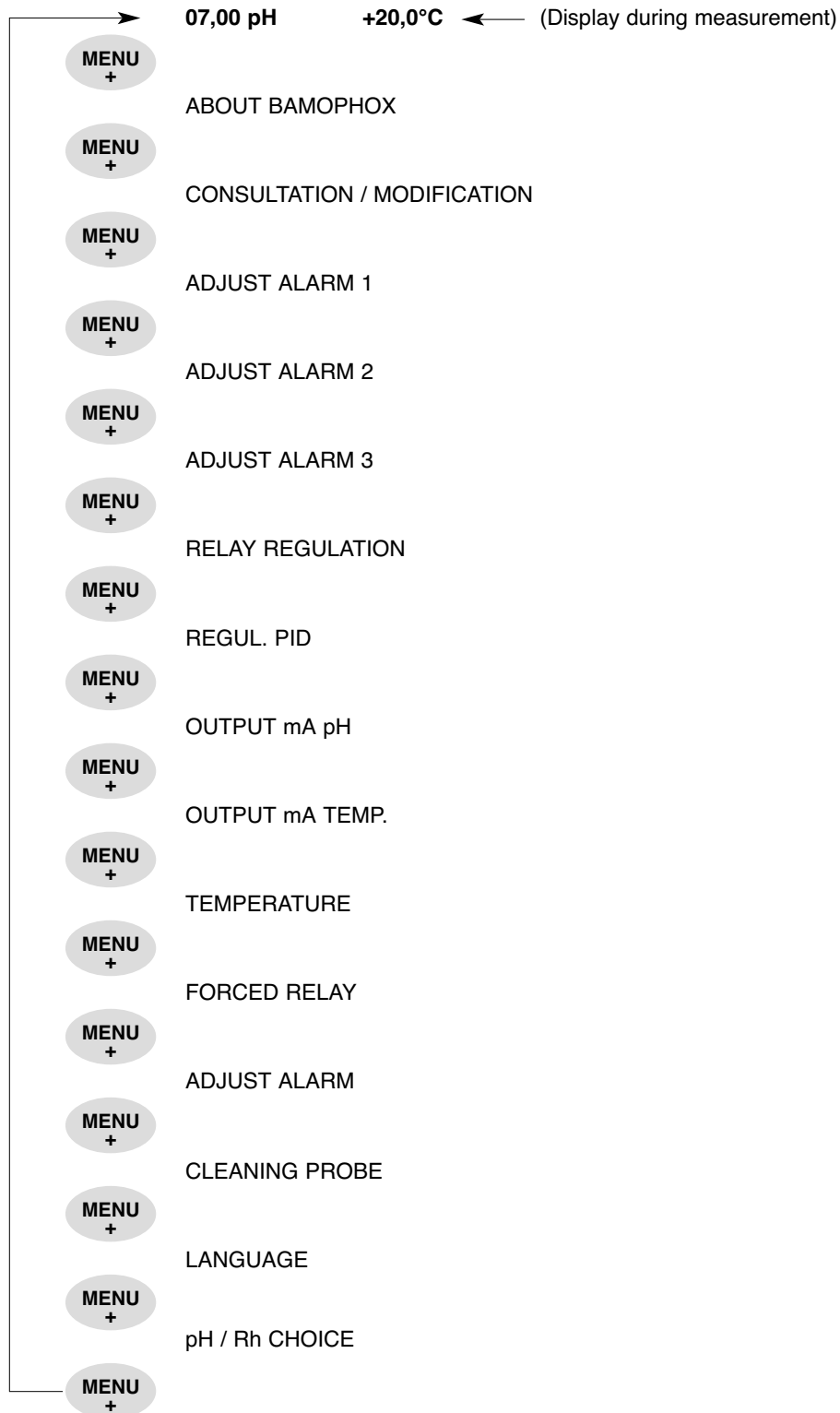
"MENU +" key

To go to the next menu.

Pushing simultaneously both keys

"MENU +" and "ENTER"
allows a fast return to measurement display.

SCROLLING MENU



ABOUT Bamophox

ENTER

ABOUT BAMOPHOX

ENTER

VERSION 2.04

ENTER

SERIAL N°

ENTER

2045105

CONSULTATION / MODIFICATION

CONSULTATION



MODIFICATION

ENTER

CODE ? 0000



ENTER

CODE ? 5105

ENTER

TIME : 30 mn

MENU
+

Last 4 digits (of serial number) are the key code to access the MODIFICATION menu.

When wrong code is entered, a message "ERROR" appears during 3 seconds.

After 30 minutes, the display returns automatically to the measurement mode.

From this mode MODIFICATION it is easy to return back to measurement for testing the relay outputs and regulation mode.

Once in modification mode, **reach measurement display and press ENTER**

ENTER

FORCED MEASURE

ENTER

0,000 pH +20°C



(one digit is flashing) Modify the value. Immediately the instrument acts within the configuration (thresholds, regulation, analog outputs ...).

When PID regulation is activated, the display shows the PID %

ENTER

FORCED PID

ENTER

0,000 pH 0,000 %



(one digit is flashing) Modify the value. Immediately the instrument acts within the configuration.

To test the analog output (mA) on PID mode: the PID should be active and in MANUAL mode.

ENTER

Press ENTER to cancel the test mode and to go back to the measurement mode.

ADJUST ALARM 1

MENU
+

ADJUST ALARM 2

ENTER

ALARM 1 ON/OFF



ENTER

ALARM 1 MEASURE/TEMP



ENTER

ALARM 1 LOW/HIGH



ENTER

ON 00,00 pH/ °C



To close the contact S1 at this value

ENTER

OFF 00,00 pH/ °C



To open the contact S1 at this value

ENTER

DELAY UP ON/OFF



ENTER

TIME 0000 SEC



Delay time to close the contact S1

ENTER

DELAYDOWN ON/OFF



ENTER

TIME 0000 SEC



Delay time to open the contact S1

ENTER

SAVING ?

VALID

ADJUST ALARM 2

MENU
+

ADJUST ALARM 3 → please, see page 10

ENTER

ALARM 2 ON/OFF



ENTER

ALARM 2 MEASURE/TEMP



ENTER

ALARM 2 LOW/HIGH



ENTER

ON 00,00 pH/ °C



To close the contact S2 at this value

ENTER

OFF 00,00 pH/ °C



To open the contact S2 at this value

ENTER

DELAY UP ON/OFF



ENTER

TIME 0000 SEC



Delay time to close the contact S2

ENTER

DELAYDOWN ON/OFF



ENTER

TIME 0000 SEC



Delay time to open the contact S2

ENTER

SAVING ?

VALID

ADJUST ALARM 3

MENU
+

REGUL REGULATION → please, see page 11

ENTER

ALARM 3 ON/OFF



ENTER

ALARM 3 MEASURE/TEMP



ENTER

ALARM 3 LOW/HIGH



MEASURE= Threshold against pH/mV measured value
TEMP= Threshold against temperature measured value

HIGH= Contact closes when value goes over the limit
LOW= Contact closes when the value goes under the limit

ENTER

ON 00,00 pH/ °C



To close the contact S3 at this value

ENTER

OFF 00,00 pH/ °C



To open the contact S3 at this value

ENTER

DELAY UP ON/OFF



Delay (or no delay) before to close the contact S3

ENTER

TIME 0000 SEC



Delay time to close the contact S3

ENTER

DELAYDOWN ON/OFF



Delay (or no delay) before to open the contact S3

ENTER

TIME 0000 SEC

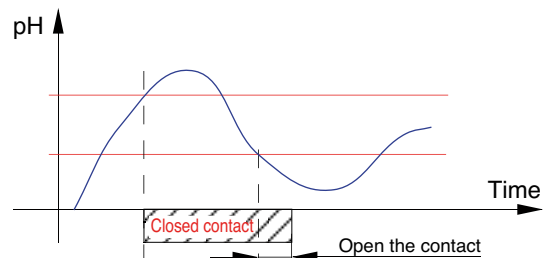
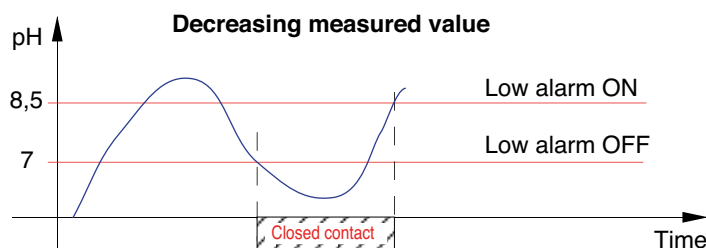
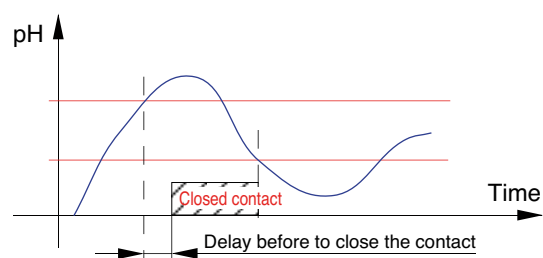
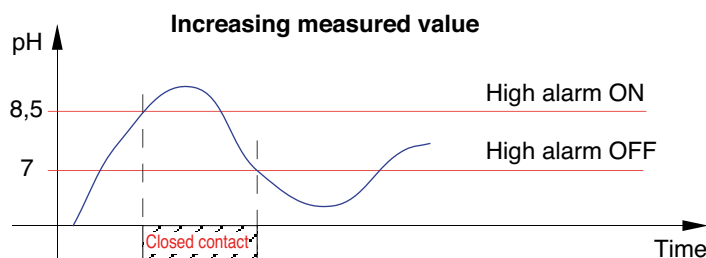


Delay time to open the contact S3

ENTER

SAVING ?

VALID



Please see page 13



Measurement

High BANDWIDTH (HIGH PB)

Highest dead zone

Lowest dead zone

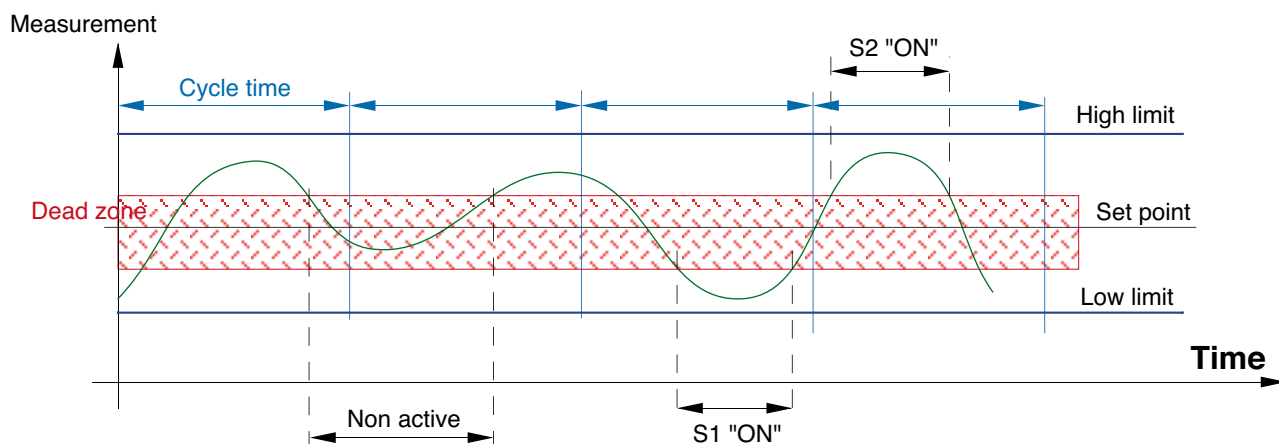
Low BANDWIDTH (LOW PB)

Highest limit BW

Set point

Lowest limit BW

Time



Example

With process configuration:

- Set point: pH 7
- High dead zone: 0,3 pH between 7 and 7,3 pH
- Low dead zone : 0,7 pH between 6,3 and 7 pH
- High BANDWIDTH: 3 pH (Limit of pH10 as a maximum)
- Low BANDWIDTH: 1 pH (Limit of pH6 as a minimum)

- Over the highest limit (from pH 10 to 14), S2 is "ON": permanent injection
- Under the lowest limit (from pH 6 to 0), S1 is "ON": permanent injection
- Inside the dead zone (from pH 6,3 to 7,3), S1 and S2 are "OFF"
- If the measurement value is between the dead zone and the highest limit (from pH 7,3 to 10) or between the dead zone and the lowest limit (from pH 6,3 to 6), the contact S1 or S2 are "ON" only for a time proportional to the step between measurement and desired value.

$$\text{Closing contact time} = \frac{\text{Cycle time} \times (\text{Measurement} - \text{Set point})}{\text{Proportional BANDWIDTH}}$$

Caution: The minimum closing time of a relay is 1 second

If the measurement $M=7,8$ when the cycle time is 10 second, the closing contact time is: $\frac{10 \times (7,8-7)}{3} = 2,66 = 3 \text{ sec}$

This operating mode allows a PID regulation with an analogic output 0/20 or 4/20 mA

ENTER	REGUL ON/OFF	▲	To switch ON or OFF the regulation mode
ENTER	REGUL AUTO/MANU	▲	MANU=MANUAL to be able to check the relays output
ENTER	SET VAL 07,00 pH	▲ ►	Set point value
ENTER	GAIN : 4,800	▲ ►	Gain setup (see also ADJUST PID PARAMETERS) (voir ci-dessous : METHODE DE REGLAGE ..)
ENTER	T.i : 0050 Sec	▲ ▲	Integral timing
ENTER	Td : 0012 Sec	▲ ►	Modification de la valeur du temps de dérivation
ENTER	ACID /BASE INJECTION	▲	
ENTER	OUTPUT 4/20 mA / 0/20 mA	▲	
VALID	SAVING ?		

To switch the PID regulation on stand-by, please input 24 V= 20 mA on terminals 5(+) and 6(-).

ADJUST PID PARAMETERS

In order to determinate the setup values for PID regulation, we recommend to use the Ziegler-Nichols open loop method

Proceed as following:

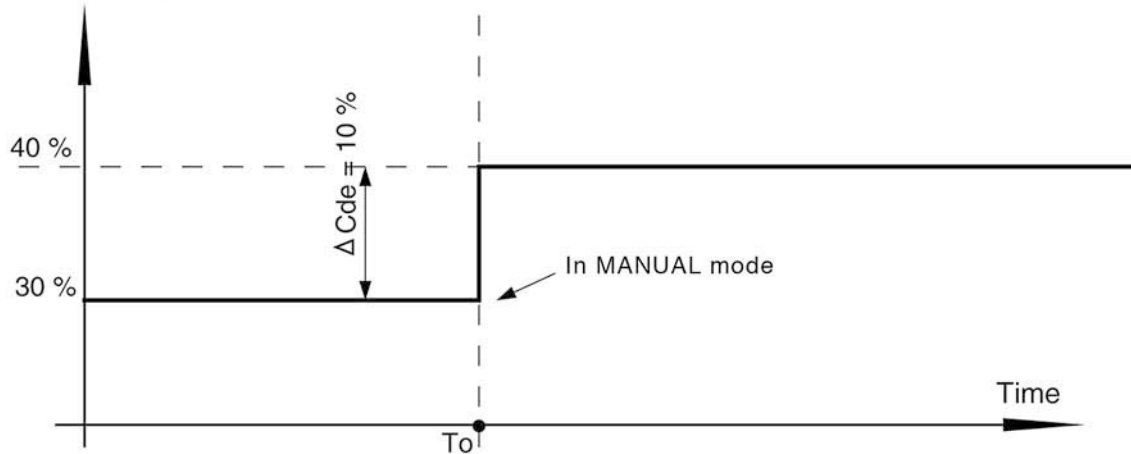
- Connect a recorder to the analogic measurement output or write the reading measurement values for then to draw the graph pH vs. time (pH, mV, etc...)
- Switch on MANUAL mode the PID regulation
- Reach to and keep close the measurement value to the set point, adjusting the PID output
- Apply on ΔCde a step of 10 % (for instance) on the analogic output (Cde) .

Example: if the value is 30%, apply 40%

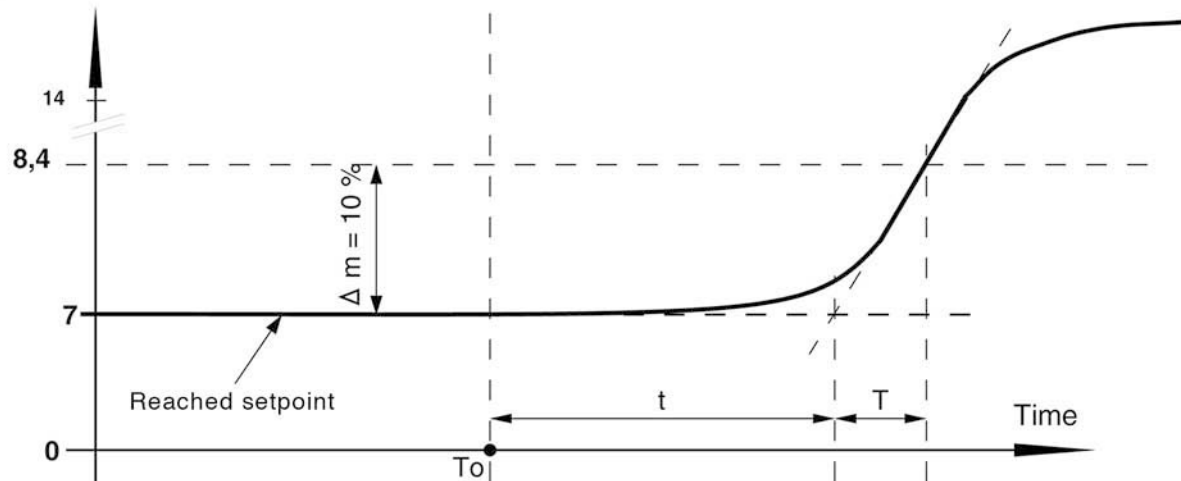
- note on the graph the corresponding timing.
- Determinate on this graph both times:
 - t = delay of response
 - T = Time corresponding to the same variation in % of measurement (Δm) and the analogic output (ΔCde), Δm = ΔCde.
 This value may be found out on the slope.
- Modify the PID parameters as following:

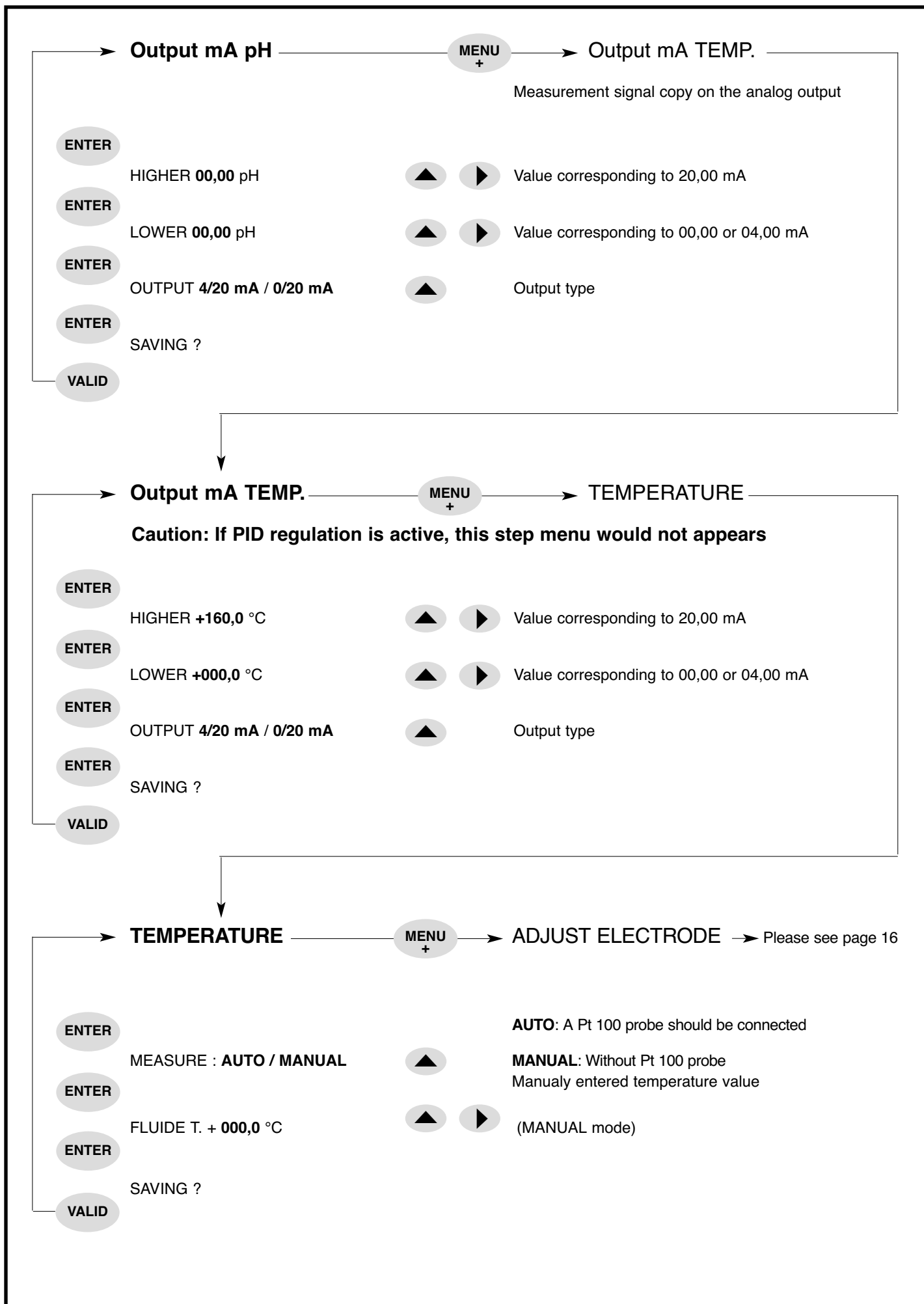
Régulation	Gain	Ti(s)	Td(s)
PID	$1,2 \times T/t$	$2 \times t$	$0,5 \times t$
PI	$0,9 \times T/t$	$3,3 \times t$	0
P	T/t	9999	0

PID analogic output



pH measurement





ADJUST ELECTRODE

MENU
+

FORCED RELAY

→ Please see page 17

CAUTION: Set up the instrument on MANUAL mode at 20°C.

ENTER

STANDARD 7,00 pH

Immerge the electrode in the buffer pH 07,00

ENTER

When display stabilizes, press ENTER to fix up the 07,00 pH (electrical zero)

ASYM. +00,00 pH

The "ASYM" value may be too high, an **"ERROR"** message appears.

- You may then check all the connections and buffer type solution.

If the **"ERROR"** message persists, please replace the electrode with a new one.

ENTER

STAND. 00,00 pH



When pH 07,00 is fixed up, rinse the electrode with tap water (Never use paper or tissue).

Enter the pH value of the next buffer (04,00 or 10,00) (it would be better to choose an acidic buffer for an acidic process)

ENTER

SLOPE 000,0 %

Sensor gain is displayed.

If it is too weak (< 70%) an **"ERROR"** message appears.

- Check the buffer solution, if persisting, please replace the electrode.

ENTER

DELAY 0000 Sec



Set up the time during the measurement values, previous to the calibration, will be displayed after saving the calibration.

ENTER

SAVING ?

VALID

CAUTION: If a PT100 probe is connected, reset the

FORCED RELAY

MENU
+

ADJUST ALARM

ENTER

ALARM 1 ON/OFF

ENTER

ALARM 2 ON/OFF

ENTER

ALARM 3 ON/OFF

ENTER

ALARM 4 ON/OFF

VALID



} Diagnostic mode to test the threshold configurations

ADJUST ALARM

MENU
+

CLEANING PROBE

When in use the S4 contact is active.

This mode allows to detect a malfunction on S1 and S2 contacts ; an overtime contact could be set up.

ENTER

WITH / WITHOUT ALARM

ENTER

TIME. S1 0005 Sec

ENTER

TIME. S2 0000 Sec

ENTER

SAVING ?

VALID



Overtime on S1 closed contact
(maximum time for active relay)

Overtime on S2 closed contact
(maximum time for active relay)

CLEANING PROBE

MENU
+

LANGUAGE

ENTER

(Contact S4)

In order to protect the regulation, all measurements are on stand-by during the cleaning process (plus a delay before to restart the operating mode).

CLEANING YES / NO

PERIOD 0000 Sec



Set up the time after which a cleaning sequence will begin

ENTER

TIME 0000 Sec



Cleaning time

ENTER

DELAY 0000 Sec



Delay after cleaning, before to restart the regulation mode

ENTER

SAVING ?



VALID

LANGUAGE

MENU
+

CHOICE OF THE PARAMETER

ENTER

ENGLISH / ITALIAN / GERMAN
FRENCH



ENTER

SAVING ?

VALID

CHOICE OF THE PARAMETER

MENU
+

Back to measurement mode

ENTER

pH / Rh - METRE



ENTER

SAVING ?

VALID