BAMOPHOX 192 E - M

Free chlorine monitor

INSTRUCTION MANUAL

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Free chlorine monitor
BAMOPHOX 192
11-05-2007 192 M1 02 E

MES
192-02/1

Free chlorine monitor
BAMOPHOX 192 / E – M

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

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1. CARACTERISTIQUES TECHNIQUES

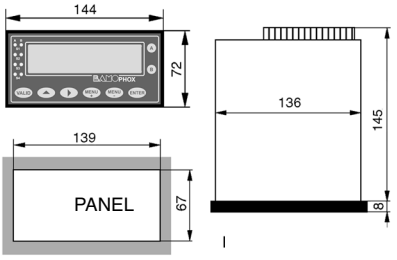
Displayed parameters:	Measurement values mg / % - Configuration Menu - Temperature value
Display:	Back lighted - 2 lines of 16 alphanumerical characters; 9.2 mm high
Indication:	LED alarms status
Configuration:	8 push buttons keyboard on front face - Keyword protected
Scales:	0 to 5 mg/L (5 ppm)
Accuracy:	± 0.3% full scale (5 ppm)
Temperature:	Input for a 3 wires Pt 100 Ω /0 °C; accuracy ± 0.3 °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 s
Output relay (S4)	Common alarm signal for: - Too long injection - Temperature out of range: - Over range, open loop - Pt 100 Ω dysfunction
Contact:	Initial resistance 100 mΩ 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
Output relay alarm	Too long injection, adjustable timer from 0 to 9999 s
ON/OFF Regulation:	Pulse time 0…9999 s - High and low proportional bandwidth, high and low dead zone.
PID Regulation:	Proportionality 0…200%, - Integrant and Derivative: 0…999 s
Calibration sequence:	Regulation on standby, relay outputs inhibited, analogical outputs stand 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)

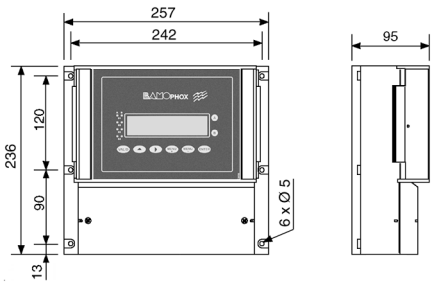
Communication:	RS422 output, J-BUS link, binary slave mode, 2400 to 9600 baud
Data Logger:	Cycle average measurement record, with a programmable period, 150000 records maxi on MMC (Multi media card) / External driver necessary for reading

2. DIMENSIONS

Extension terminal:
identical to the panel
or wall mounting



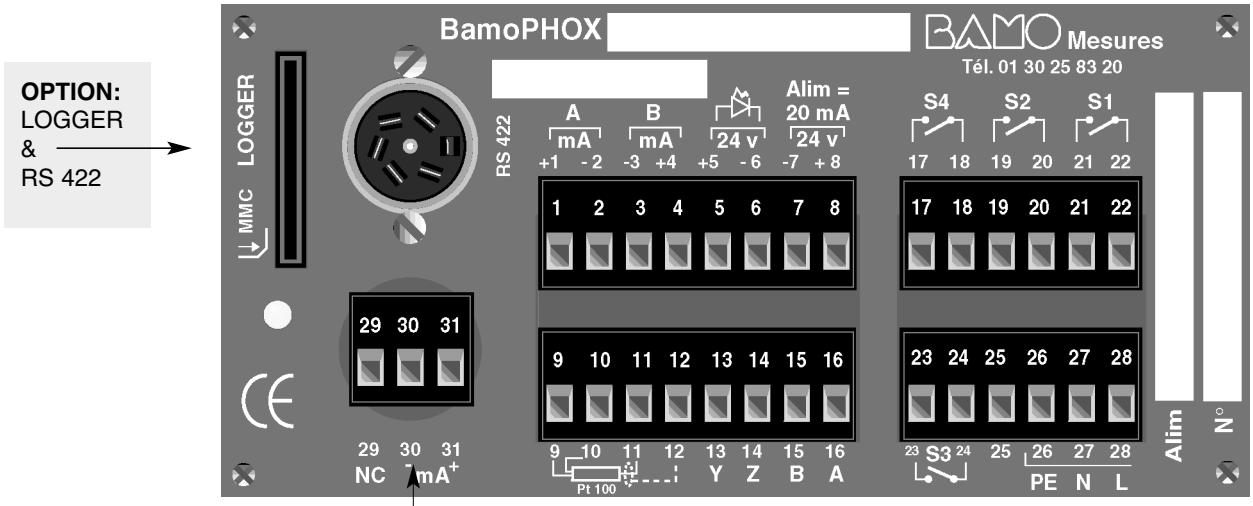
Panel mounting instrument



Wall mounting instrument

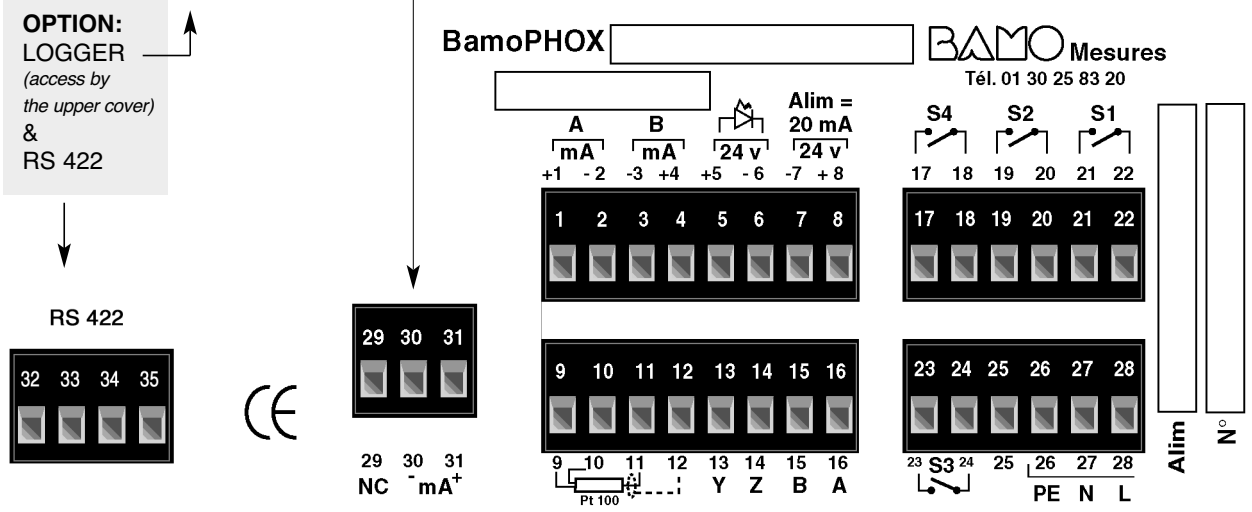
3. WIRING

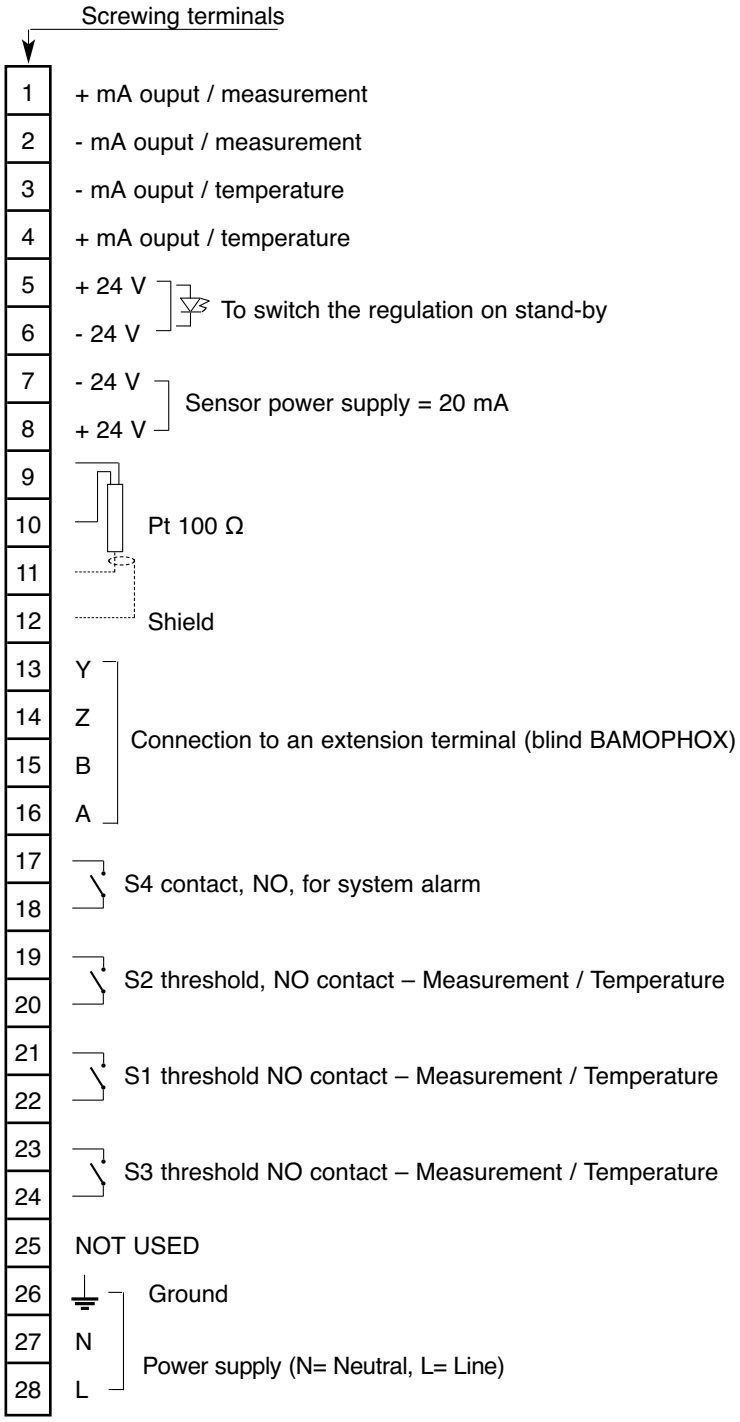
PANEL MOUNTING



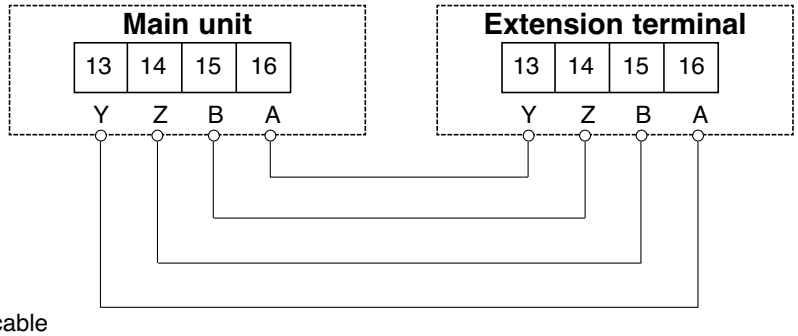
Measurement input

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
  ≥ 0,25 mm² cross section

4. FRONT PANEL

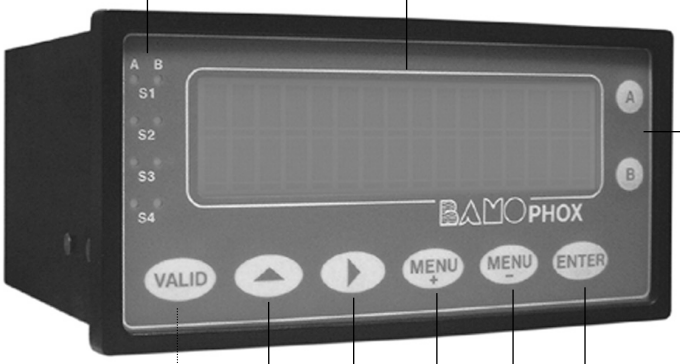
S1, S2, S3, and S4
indicate relays status:

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

"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.

To change parameters of data capture:

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

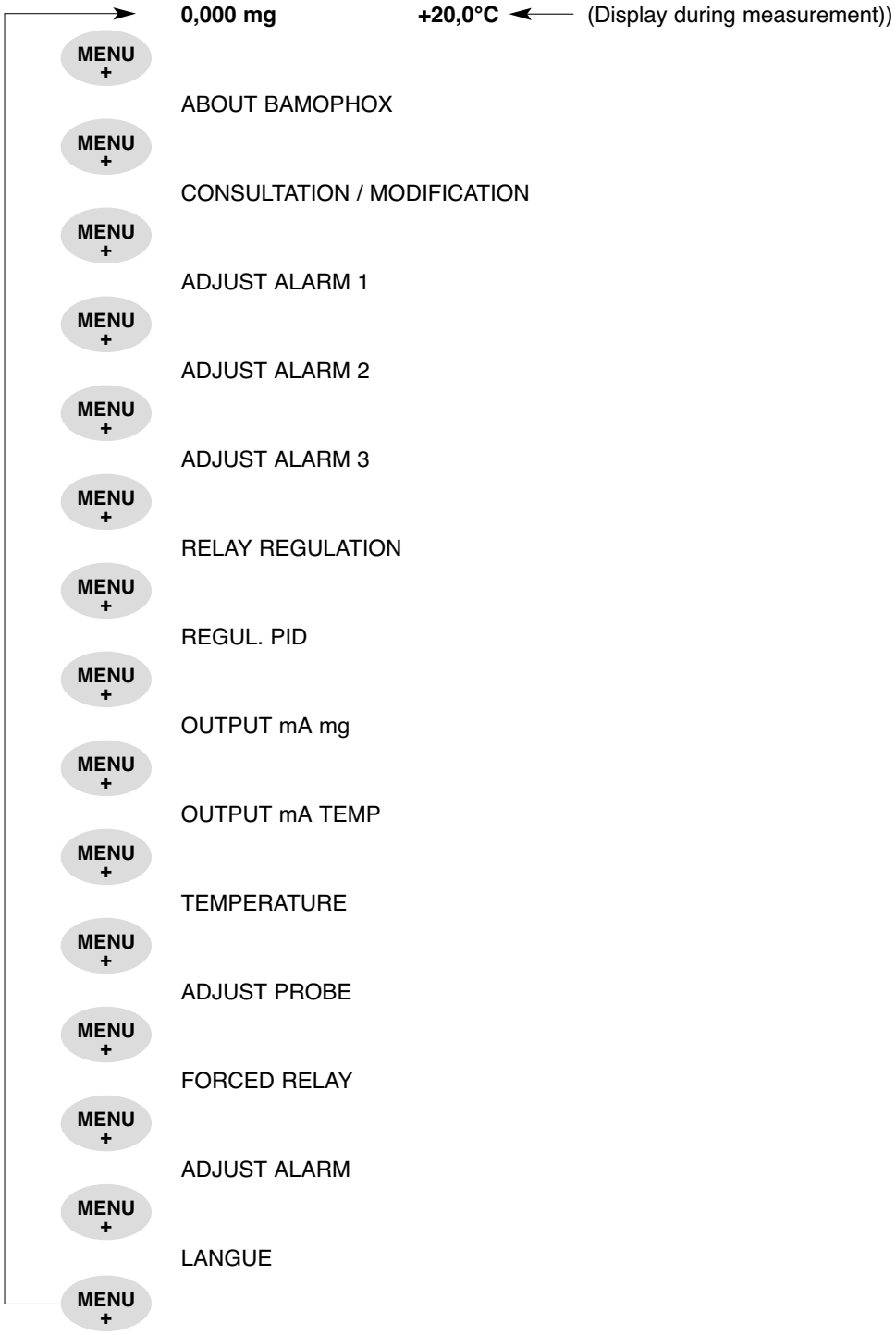
Reverse the choice Yes / No,
Up/Down, 0-20 mA / 4-20 mA etc.

"MENU +" key
To go to the next menu.

Pushing simultaneously both keys
"**MENU +"** and **"ENTER"**
allows a fast return to measurement display.

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

SCROLLING MENU



ABOUT Bamophox

ENTER — ABOUT BAMOPHOX

ENTER — VERSION 2.04

ENTER — SERIAL N°

ENTER — 20451 05

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

00,00 mg 00°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

00,00 mg 00°C ▲ ▶

(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** ▲

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

ENTER

ALARM 1 LOW/HIGH ▲

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

ENTER

ON **0,000** mg / °C ▲ ▶ To close the contact S1 at this value

ENTER

OFF **0,000** mg / °C ▲ ▶ To open the contact S1 at this value

ENTER

DELAY UP **ONI/OFF** ▲ Delay (or no delay) before to close the contact S1

ENTER

TIME **0000** SEC ▲ ▶ Delay time to close the contact S1

ENTER

DELAYDOWN **ON/OFF** ▲ Delay (or no delay) before to open the contact S1

ENTER

TIME **0000** SEC ▲ ▶ Delay time to open the contact S1

ENTER

SAVING ?

VALID

ADJUST ALARM 2

ENTER

MENU + → ADJUST ALARM 3 → please, see page 10

ENTER

ALARM 2 **ON/OFF** ▲

ENTER

ALARM 2 **MEASURE/TEMP** ▲

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

ENTER

ALARM 2 LOW/HIGH ▲

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

ENTER

ON **0,000** mg / °C ▲ ▶ To close the contact S2 at this value

ENTER

OFF **0,000** mg / °C ▲ ▶ To open the contact S2 at this value

ENTER

DELAY UP **ONI/OFF** ▲ Delay (or no delay) before to close the contact S2

ENTER

TIME **0000** SEC ▲ ▶ Delay time to close the contact S2

ENTER

DELAYDOWN **ON/OFF** ▲ Delay (or no delay) before to open the contact S2

ENTER

TIME **0000** SEC ▲ ▶ Delay time to open the contact S2

VALID

SAVING ?

ADJUST ALARM 3

MENU + → RELAY REGULATION → please, see page 11

ENTER

ALARM 3 **ON/OFF** ▲

ENTER

ALARM 3 **MEASURE/TEMP** ▲

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

ENTER

ALARM 3 LOW/HIGH ▲

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

ENTER

ON **0,000** mg / °C ▲ ▶

To close the contact S3 at this value

ENTER

OFF **0,000** mg / °C ▲ ▶

To open the contact S3 at this value

ENTER

DELAY UP **ONI/OFF** ▲

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

ENTER

TIME **0000** SEC ▲ ▶

Delay time to close the contact S3

ENTER

DELAY DOWN **ON/OFF** ▲

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

ENTER

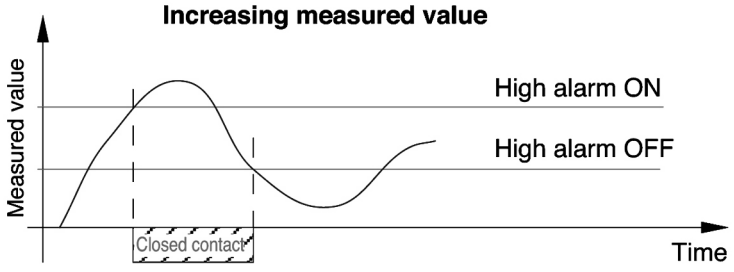
TIME **0000** SEC ▲ ▶

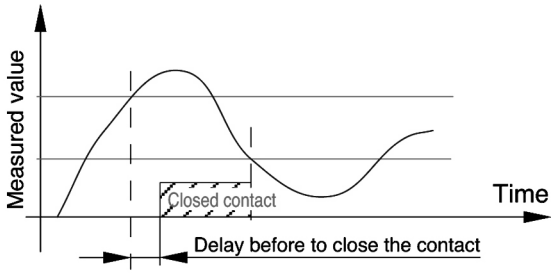
Delay time to open the contact S3

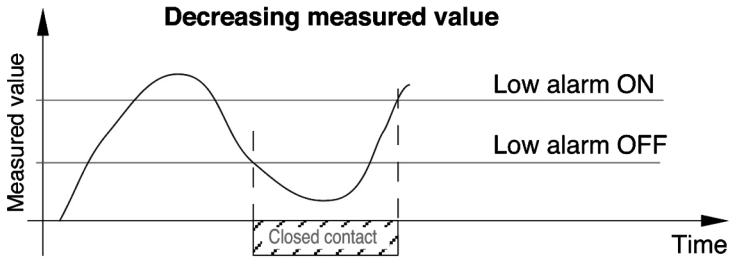
ENTER

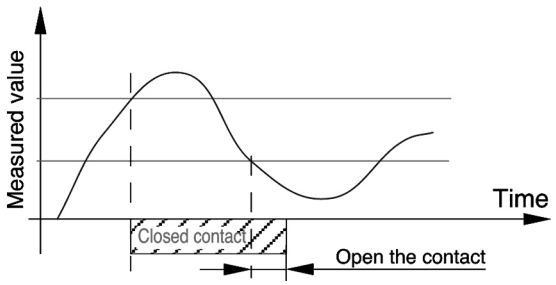
SAVING ?

VALID









RELAY REGULATION

MENU + → REGUL. PID → Please see page 13

ENTER

ON/OFF MODE

ENTER

Indicates when S1 or S2 are "ON"
Back to "ADJUST ALARM" to switch
OFF S1 or S2

ENTER

REGUL. PID

ENTER

Indicates when "REGUL. PID" is
operating
Back to "REGUL. PID" menu
to switch it OFF

REGUL **ON/OFF**

ENTER

SET VAL. **0,000** mg — Set point

ENTER

T. CYCLE **0000** SEC — Cycle time

ENTER

HIGH PB **00,00** mg — Highest limit for proportional bandwith

ENTER

LOW PB **00,00** mg — Lowest value for dead zone

ENTER

H IGH DZ **00,00** mg — Highest value for dead zone

ENTER

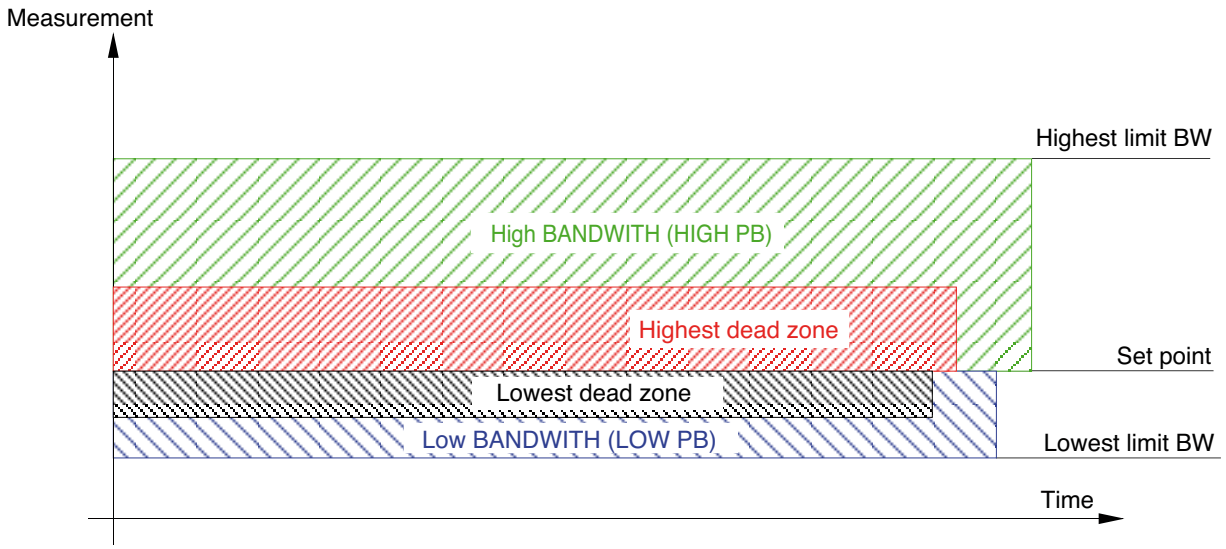
LOW DZ **00,00** mg — Lowest value for dead zone

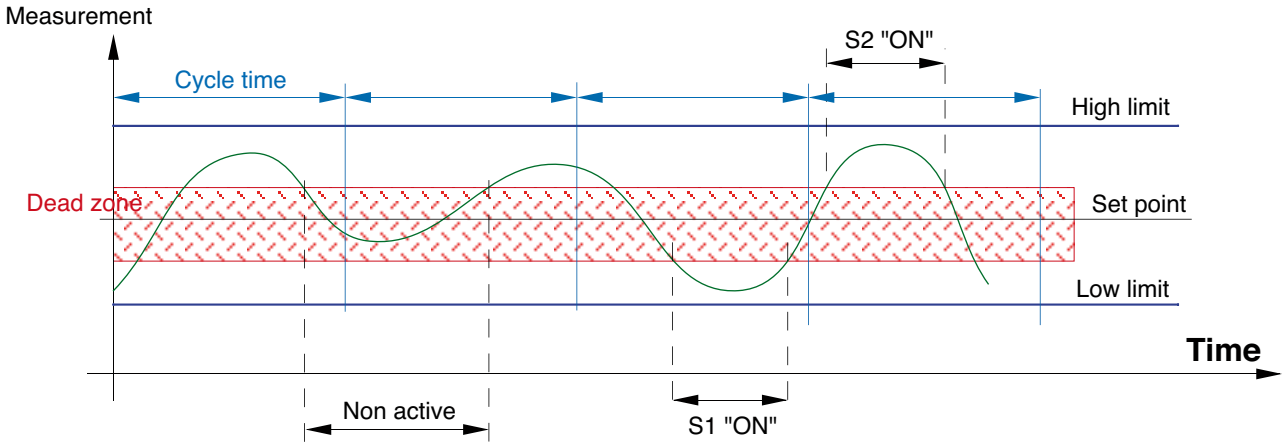
ENTER

SAVING ?

VALID

Caution: On S1 you set up the lowest value for proportional bandwith and respectively S2 for the highest value.





Example

With process configuration:

- Set point: 0,500 mg
- High dead zone: 0,050 mg that is between 0,500 and0,550 mg
- Low dead zone : 0,050 mg that is between 0,450 and0,500 mg
- High BANDWITH: 0,400 mg (Limit of 0,900 mg as a maximal limit)
- Low BANDWITH: 0,400 mg (Limit of 0,100 mg as a minimal limit)

- Over the highest limit (from 0,9 to 2,0 mg), S2 is “ON”: permanent injection
- Under the lowest limit (from 0 to 0,1 mg), S1 is “ON”: permanent injection
- Inside the dead zone (from 0,45 to 0,55 mg), S1 and S2 are “OFF”
- If the measurement value is between the dead zone and the highest limit (from 0,55 to 0,90 mg) or between the dead zone and the lowest limit (from 0,10 to 0,45 mg), the contact S1 or/and S2 are “ON” only for a time proportional to the step between measurement and set point.

$$\text{Closing contact time} = \frac{\text{Cycle time x (Measurement - Set point)}}{\text{Proportional BANDWITH (high or low)}}$$

Caution: The minimum closing time of a relay is 1 second
If the measurement M=0,680 when the cycle time is 10 second, the closing contact time is:

$$\frac{10 \text{ x } (0{,}68 - 0{,}50)}{0{,}400} = 4{,}5 = 5 \text{ s}$$

REGUL PID — MENU + → Output mA free chlorine → Please see page 15

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

	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 **0,000 mg**	▲ ▶	Set point value
ENTER			
	GAIN : **0,000**	▲ ▶	Gain setup (see also ADJUST PID PARAMETERS)
ENTER			
	T.i : **0050** Sec	▲ ▲	Integrant setup
ENTER			
	Td : **0012** Sec	▲ ▶	Derivative setup
ENTER			
	ACTION: **DIRECT/REVERSE**	▲	
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:

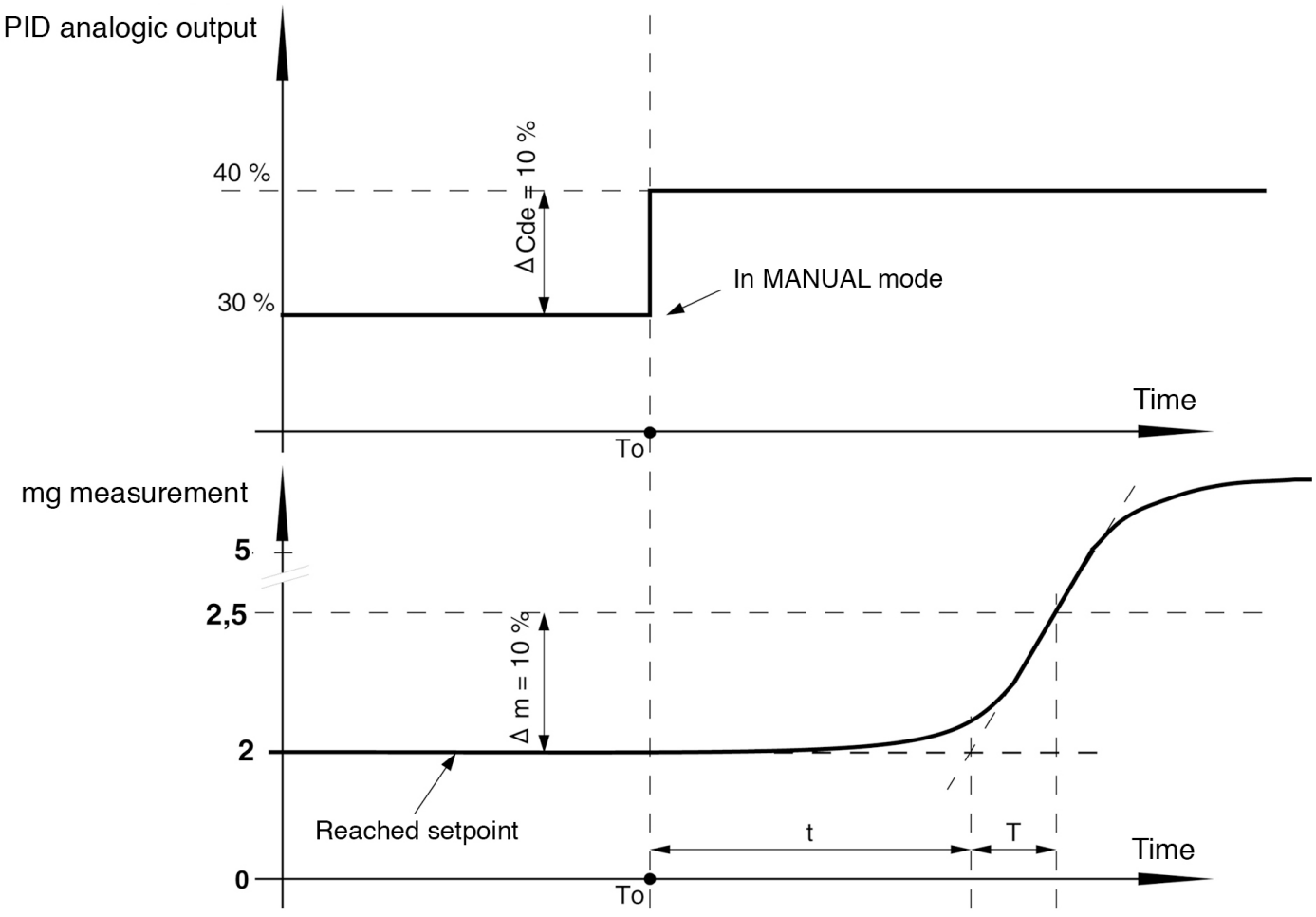
- Connect a recorder to the analogic measurement output or write the reading measurement values for then to draw the graph $f_{(time)}$
- Switch on the PID regulation in MANUAL mode
- Reach to and keep close the measurement value to the set point, adjusting the PID output
- Apply on ΔCde a step of 10 % (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 t ant T:
  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:

Regulation	Gain	Ti(s)	Td(s)
PID	1,2 x T/t	2 x t	0,5 x t
PI	0,9 x T/t	3,3 x t	0
P	T/t	9999	0


PID analogic output
40 %
30 %
Δ Cde = 10 %
In MANUAL mode
Time
To
mg measurement
5
2,5
2
0
Δ m = 10 %
Reached setpoint
t
T
Time
To

Output mA Free chlorine — MENU + → Output mA TEMP.

Measurement signal copy on the analog output

ENTER

HIGHER **0000** mg — ▲ ▶ — Value corresponding to 20,00 mA

ENTER

LOWER **0000** mg — ▲ ▶ — Value corresponding to 00,00 or 04,00 mA

ENTER

OUTPUT **4/20 mA** / **0/20 mA** — ▲ — Output type

ENTER

SAVING ?

VALID

Output mA TEMP. — MENU + → TEMPERATURE

Caution: If PID regulation is active, this step menu would not appears

ENTER

HIGHER **0000** °C — ▲ ▶ — Value corresponding to 20,00 mA

ENTER

LOWER **0000** °C — ▲ ▶ — Value corresponding to 00,00 or 04,00 mA

ENTER

OUTPUT **4/20 mA** / **0/20 mA** — ▲ — Output type

ENTER

SAVING ?

To switch on stand by the PID connect 24 V= 20 mA on terminals 5(+) and 6(-)

VALID

TEMPERATURE — MENU + → ADJUST ELECTRODE → Please see page 16

ENTER

AUTO: A Pt 100 probe should be connected

MEASURE : **AUTO / MANUAL** — ▲ — **MANUAL**: Without Pt 100 probe
Manualy entered temperature value

ENTER

FLUIDE T. + **000,0** °C — ▲ ▶ — (MANUAL mode)

ENTER

SAVING ?

VALID

Caution: Set up the instrument on MODIFICATION mode (page 8)
During the standardization the measurement value is on standby, until the measurement mode is recalled, plus a timing adjustable in "DELAY" (hereunder).

This allows a confortable operation with a reset of the process.

ENTER

ZERO **YES/NO** ▲ ▶

NO: Send directly to the menu "SLOPE" (see below)
Si non, affichage de **ETAL. PENTE**

ENTER

SOL ZERO 0 mg

Let flows the 0 chlorine water
(through the active charcoal filter).

ENTER

ASY 0,342 mg

Wait at least 5 minutes for zero stabilization

ENTER

If the measured value at "0 mg" is still too high,
an **ERROR** message appears.
Check the filter and if the cell is not too dirty.

SLOPE **YES/NO**

When the ZERO measurement is done or if you did not choose to calibrate it, you may calibrate the slope.

ENTER ▲ ▶

Let flows the sample water; measure the chlorine concentration with the chlorometer; notethe value.

SAMPLE 0,000 mg

Enter here this value corresponding to the sample.

Closier to the instrument full scale value, better is the accuracy.

ENTER

▲ ▶

Display of the instrument GAIN

SLOPE xxx,x %

CAUTION: If the SLOPE is >150% or <50% DO NOT SAVE

Check the filter and the dirtiest of the cell.

If the SLOPE is correct, please proceed to a second calibration to confirm the value.

ENTER

DELAY 0000 Sec

ENTER

VALIDATION ?

VALID

Return to measurement mode through the menu

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 + → LANGUAGE

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 ▲ ▶ Overtiming on S1 closed contact (maximum time for active relay)

ENTER

TIME. S2 **0000** Sec ▲ ▶ Overtiming on S2 closed contact (maximum time for active relay)

ENTER

SAVING ?

VALID

LANGUAGE — MENU + → Back to measurement mode

ENTER

ENGLISH, ITALIAN, FRENCH ▲

ENTER

VALIDATION ?

VALID