Operating instructions

Measurement Analyser for the measurement of:

- pH
- Redox
- Temperature
- Conductivity
- Chlorine

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Operating instructions

Content

Operating instructions

1. General

1.1 General user information

Always comply with the general applicable instructions at the installation site before start-up and during operation of **sera** products.

sera products are delivered ready for operation. Carefully read these instructions and particularly the safety instructions before putting the system into operation.

For the installation of the analysis components, the owner is obligated to comply with the applicable local regulations and the applicable accident prevention regulations.

1.2 Symbols and notes used in these operating instructions

Special notes in these operating instructions are marked with text and danger symbols.

Notes (Text and symbol)	Danger type: Danger to life	Danger type: Risk of injury	Danger type: Dam. to property	Meaning (in the operating instructions)
DANGER! 	X	X	X	Identifies **imminent danger** that could lead to death or serious injury if not avoided.
WARNING! 	X	X	X	Indicates a potentially dangerous situation that could lead to death or serious injury and damage to property if not avoided.
CAUTION! 		X	X	Indicates a potentially dangerous situation that could lead to slight or minor injury or damage to property if not avoided.
ATTENTION! 			X	Indicates a potentially dangerous situation that could lead to damage to property if not avoided.
NOTE! 				Indicates information which help to facilitate the work and is useful for a trouble-free operation.

1.3 Marking of notes on the product

Symbols which are directly attached to the device are to be observed and kept in legible condition.

1.4 Quality instructions

Please read these operating instructions carefully before the device is started or serviced. Observance of these operating instructions and, in particular, the safety instructions, helps to:

- Avoid dangers to persons, machines, and environment.
- Increase reliability and service life of the device and the complete system.
- Reduce repair cost and downtime.

The **sera** quality management and quality assurance system for pumps, systems, and fittings is certified according to DIN EN ISO 9001.
sera products comply with the valid safety requirements and accident prevention regulations.

ATTENTION!

Always keep these operating instructions within reach at the place of installation!

CAUTION!

Pay attention to the safety data sheet of the pumped medium! The owner must take corresponding accident prevention measures to protect operating personnel from danger through the pumped media used!

2. Safety instruction

2.1 Dangers in case of inobservance of the safety instructions

Inobservance of these safety instructions can result in danger to persons, hazards to the environment and damage to the product.
Inobservance can result in:

- Failure of important functions of the device/system.
- Inobservance of prescribed methods for maintenance and servicing.
- Danger to persons through chemical influences.
- Hazards to the environment through leaking dangerous media.

2.2 Safety conscious working

The safety instructions specified in these operating instructions, the national regulations concerning ac-cident prevention as well as internal working-, operating-, and safety instructions of the owner are to be observed.

2.3 Intended use

sera products must exclusively be used for the intended use stated in the associated product description.

If the system is to be used for other applications, the suitability of the system for the new operating conditions must be clarified with **sera**!

The measurement analyser is exclusively intended for:

- measuring the pH value or the redox voltage
- measuring the temperature
- measuring the conductivity
- measurement of chlorine
- display of the measured values
- generation of output signals for the control of actuators and transmission of measured values.

Other uses or conversion are not permitted.

The device must not be placed outdoors without protection against direct sunlight or weathering influences (e.g. protective roof).

sera shall not accept any liability if these criteria are not or are only partly specified or complied with by the purchaser / owner.

ATTENTION!

The device is not suitable for the intended use in Ex-zones!

2.4 Approved installation-, maintenance and operating personnel

The system operator may only approve persons to operate or maintain the unit, who are at least eighteen years old and suitably qualified, and of a physical and mental state to perform the tasks entrusted to them. These persons must be properly instructed and act responsibly, properly, and reliably. The operating personnel must be familiar with all applicable accident prevention and safety instructions and regulations.

3. Transport and storage

3.1 General

On delivery, immediately check the packaging for damage. Report any external damage immediately to the transport company, and fill in a damage report. After the transport company has recorded the damage, open the package and check the contents for damage.

3.2. Storage

An undamaged packaging protects the unit during subsequent storage and should only be opened when the device is installed.

Proper storage increases the service life of the device and comprises prevention of negative influences such as heat, humidity, dust, chemicals etc.

The following storage instructions are to be observed:

- Storage place: cool, dry, dust-free and slightly ventilated
- Storage temperatures between +2°C and +40°C
- Relative air humidity not more than 50%.

If these values are exceeded, metal products should be sealed in foil and protected from condensation water with a suitable desiccant.

Do not store solvents, fuels, lubricants, chemicals, acids, disinfectants and similar in the storage room.

4. Technical data

Function	Description	Details
General	Power supply	110-230 VAC +/-10%, 24VDC +/-10%, 12VDC +/-10%
	Current consumption	60mA (230VAC)
	Cable lengths for sensors	Max. 15m
	Dimensions	approx. 250 x 250 x 95mm
	Protection class	IP65
	Fuse	5A, slow-blow (250V)
	external disconnecting device	Residual-current device – nominal current 10A
	Installation height	Max. 2000 m above sea level
	Operating temperature	+2..45 °C
	Humidity	80% at 31 °C
	Pollution degree	2
	Mounting	inside; outside under protection against direct sunlight and weather influences
Measurement signals	pH	0…14 pH (+/-5%)
	Redox	-2000…+2000 mV (+/-5%)
	Chlorine	-1000…+0 mV (+/-5%)
	Conductivity	50 µS/cm…5 mS/cm (+/-5%)
	Temperature	PT100
Analogue inputs	AI1	0/4…20mA Load 50 Ω
	AI2	0/4…20mA Load 50 Ω
Digital inputs	D1, D2, D3, D4	Level (using potential-free contact)
	D5	External On/Off (using potential-free contact)
	D6	Flow rate (using potential-free contact)
Analogue outputs	AO1	0…20mA max. Load 150 Ω
	AO2	0…20mA max. Load 150 Ω
Digital outputs	RL1	110…230 V AC, max. 5 A
	RL2	110…230 V AC, max. 5 A
	RL3	Potential-free, contact load max. 250 V AC, 5 A
	RL4	Potential-free, contact load max. 250 V AC, 5 A
	P1	Potential-free, contact load max. 30 V AC, 0.5A
	P2	Potential-free, contact load max. 30 V AC, 0.5A

5. Assembly and installation

ATTENTION!

For outdoor installation, protect the measurement analyser against direct sunlight and weather influences!

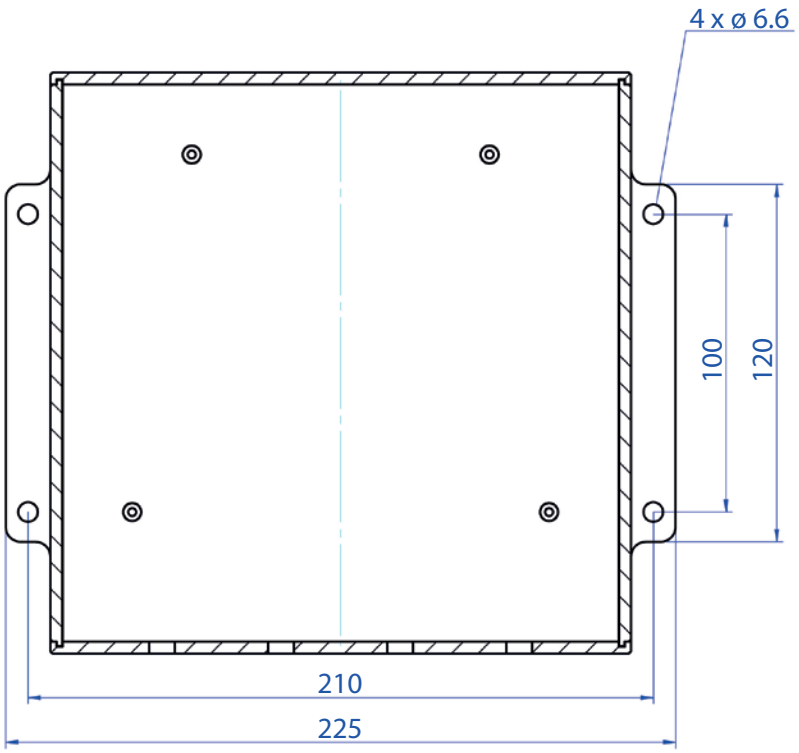
Installation conditions:

- The controller should be fixed in a stable way to guarantee a secure operation.
- All the operations executed by the installer on the inputs and outputs of the controller should be executed with the controller switched off.
- It is necessary to install a allocated circuit breaker up to 10 A for the controller (Characteristic C). The circuit breaker should be installed near the controller.

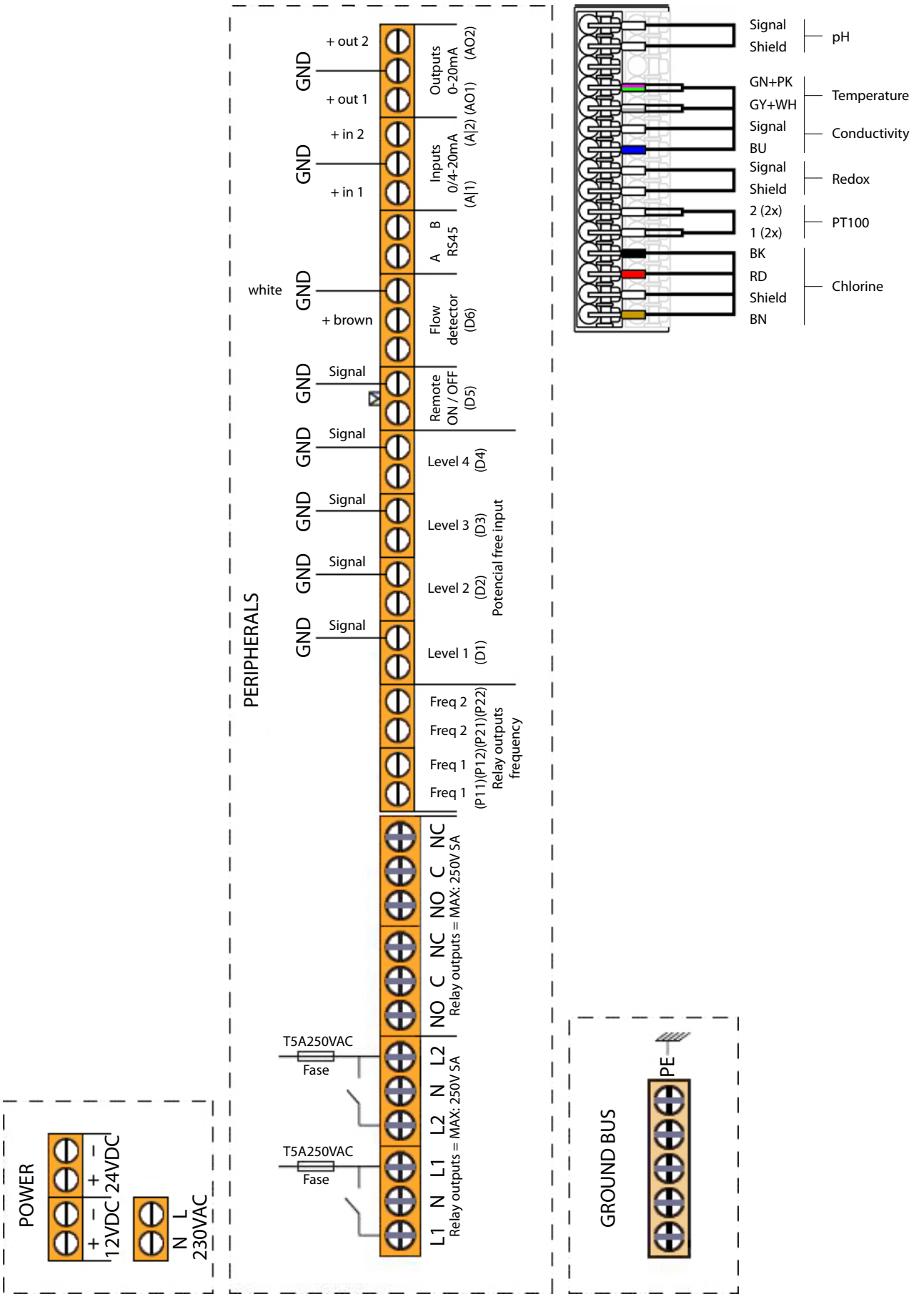
5.1 Wall mounting

Proceed as follows for wall mounting:

- Open measurement analyser
- Mark two diagonal drill holes.
- Drill holes.
- Screw on device



5.2 Terminal diagram



5.3 Electrical connection

ATTENTION!

Only let the measurement analyser be installed by authorised and qualified personnel!

Power cable type: H03VVH2-F (examble)

Cross section: min. 3 x 0,75mm2

Cable length: max. 50m

5.3.1 pH / Redox

A coaxial cable is used for the connection of the pH and redox sensors:

- Strip cable insulation.
- Connect the core / inner conductor to the Signal connection.
- Expose the shield and clamp to the *Signal* connection.

5.3.2 Conductivity

- Strip cable insulation.
- Connect the signal conductor and the temperature sensor (PT1000) to the Conductivity terminals in accordance with the separate data sheet for conductivity measurement.

ATTENTION!

The temperature sensor (PT1000) to be connected to the Conductivity terminals is only used for compensation of the conductivity measurement!

5.3.3 Chlorine

- Strip cable insulation.
- Connect the signal conductor and the temperature sensor to the *Chlorine* terminals in accordance with the separate data sheet for conductivity measurement.

5.3.4 Temperature

- Strip cable insulation.
- Connect the signal conductor of the temperature sensor (PT100) to the PT100 terminals in accordance with the separate data sheet.

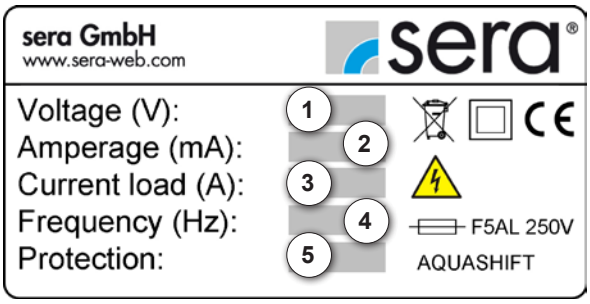
ATTENTION!

The temperature sensor (PT100) to be connected to the PT100 terminals is only used for compensation of the chlorine or pH measurement!

6. Product description

6.1 Type plate

Each **sera** product is factory provided with a type plate. The following information can be found on this type plate



No.	Description
1	Voltage (V)
2	Amperage (mA)
3	Current load (A)
4	Frequency (Hz)
5	Protection

6.2 Materials

The materials used are stated in the order confirmation.

6.3 General

The measurement analyser is a microprocessor-controlled measurement analyser which displays selected measured values and generates a proportional output signal. It also processes the temperature as correction factor.

The measured value can be selected by the user:

- pH
- pH with temperature compensation
- Redox
- Chlorine
- Chlorine with pH compensation (option)
- Conductivity
- External analogue 1 (option)
- External analogue 2 (option)

6.4 Button functions

Button	Function
	Back; cancel process; return to the main menu at any time (press and hold for 5 seconds)
	Next; confirm input; reset alarm (press and hold for 5 seconds)
	Navigation in the menu; increase value
	Navigation in the menu; decrease value

6.5 Menu structure

More information on the structure of the menu please take out of the schematic representation of the Menu Structure in the appendix.

6.6 Main menu

The main menu provides information about the current state of the measurement analyser. The main elements are the display of the current measured values and the status of any configured outputs and active alarms. The state of the AUX function is displayed in the upper area. The lower display area visually shows the status of the login, the weekly timer, the recording of data on the SD card, external enable and date and time.

NOTE!

Display of 2 channels or version as 2-channel device is an option!

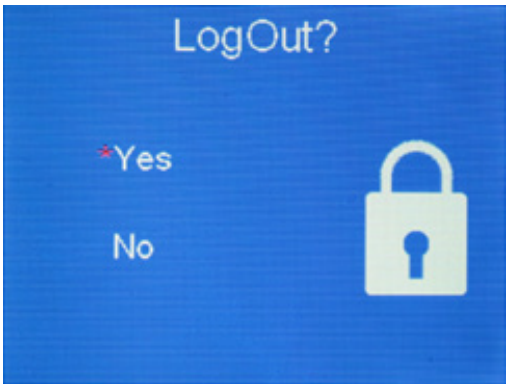
6.7 Login / Logout

The code for enable is entered in the Login / Logout menu. The Login is always necessary if the operator makes changes in the configuration. If the Login has been performed successfully, the key symbol in the main menu view is extinguished.

The Logout is performed in 2 different ways:

- By pressing the button 
- Automatically if no operation has been performed within 5 minutes.

The Logout is indicated by the key symbol on the display.

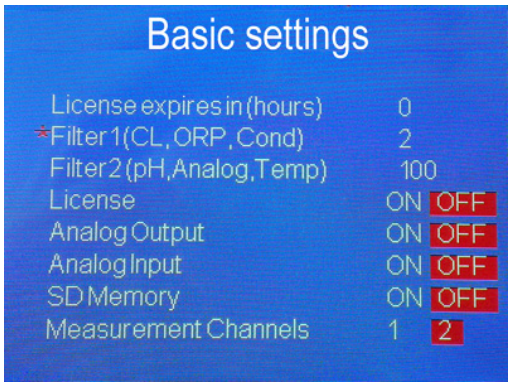


6.7.1 Login Parameterisation

The manufacturer code for the Login is 1 2 3 4. This code can be set individually in the System menu. After entering the code and confirmation with the ENTER key, the parameterization of the Measurement Analyser is unlocked.

6.7.2 Login Basic settings

The manufacturer code for Login to Basic settings (Master-Code) is 7 3 0 8. After entering the code and confirmation with the ENTER key, the Basic settings can be changed.



Following settings can be made:

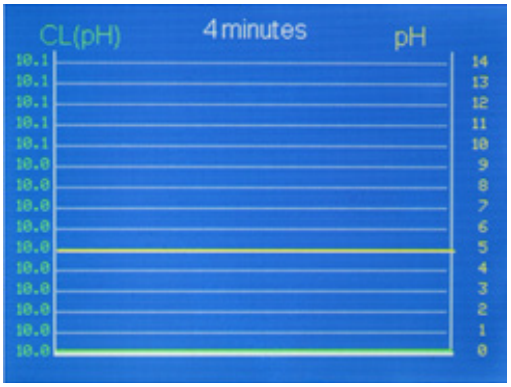
- Unlocking analog outputs
- Unlocking analog inputs
- Unlocking SD card
- Selecting measurement channels

NOTE!

The Mastercode cannot be changed!

6.8 Graphik

The measured values are displayed graphically in the Graph menu. You can select between 4 min, 30 min, 1 h, 4 h and 21 h as the time period for the display of the measured values.

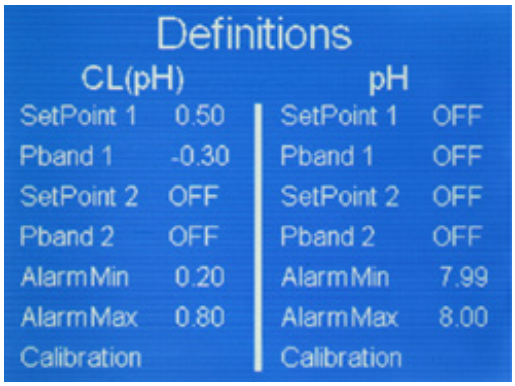


Graphical display of the measured values

6.9 Definitions

All the important parameters for the control and outputs are set in the *Definitions* menu.

Set Point 1/2:	Up to 2 setpoints per channel can be defined.
Pband 1/2:	Declaration of the Pband defines the control characteristic and the specification of the control behaviour.
AlarmMIN:	Selection of the measured value which triggers an alarm if it is undercut.
AlarmMAX:	Selection of the measured value which triggers an alarm if it is exceeded.
Calibration:	This menu item starts the routine for the calibration of the connected sensor.



NOTE!

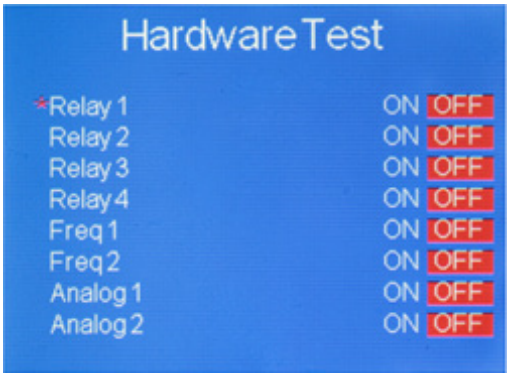
Display of 2 channels or version as 2-channel device is an option!

6.10 Sytem

The System menu shows information and settings can be made which are not directly associated with the acquisition of analysis values and rules of parameters.
The firmware version and the serial number can be read directly.
Note: The RS485 menu item is not yet available.

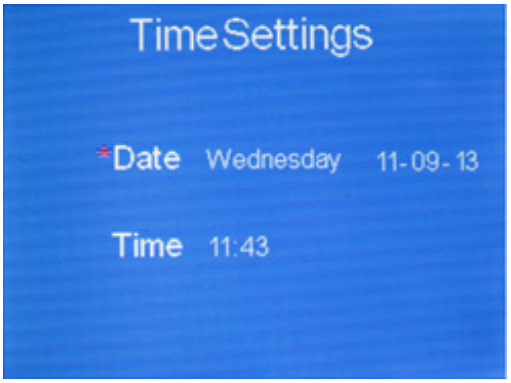
6.10.1 Hardware Test

The outputs can be actuated and tested in the Hardware Test menu item.



6.10.2 Date and time

The date and time are shown in the Time Settings menu item.



6.10.3 Languages

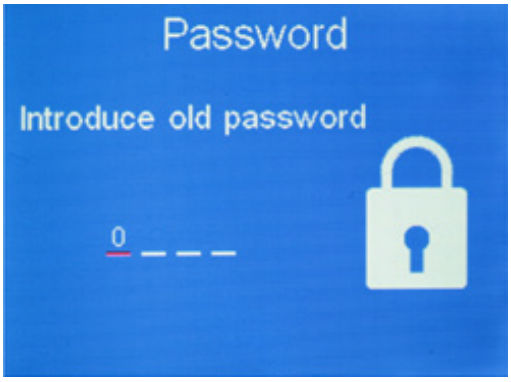
The languages German, English, Portuguese, French, Spanish and Turkish are available in the measurement analyser.

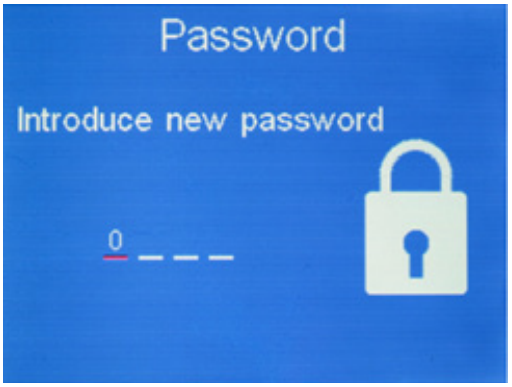
6.10.4 Brightness

The brightness of the display can be adjusted in the brightness menu.

6.10.5 Setting password

The password can be defined individually by the user. With the password, all menu items according to Figure 2 are protected against unauthorised operation. The manufacturer code of the password is 1 2 3 4.



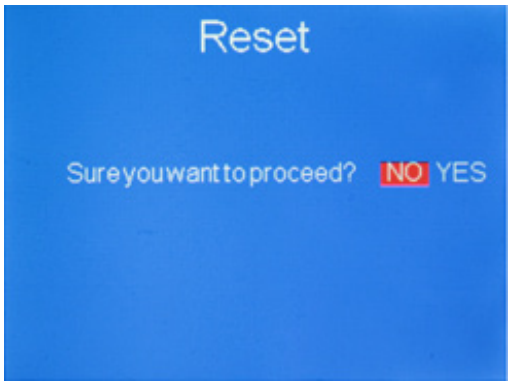


6.10.6 Reset

The Reset menu item resets all settings of the measurement analyser to the factory settings.

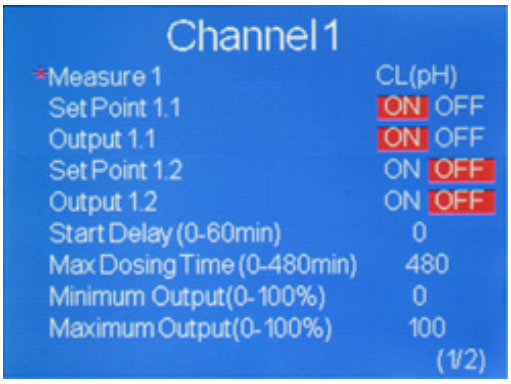
NOTE!

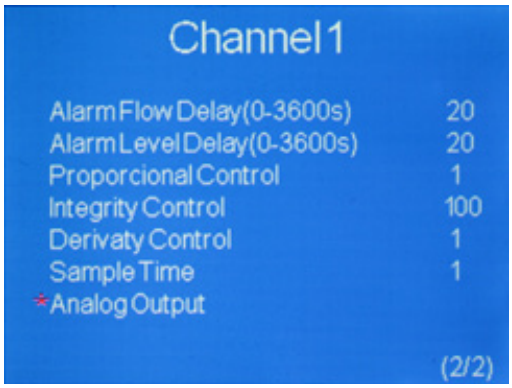
The Reset also includes the password (manufacturer code 1 2 3 4)

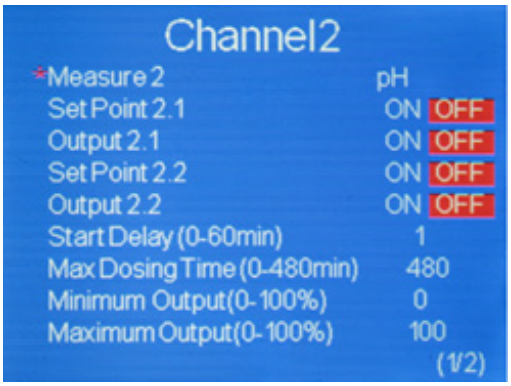


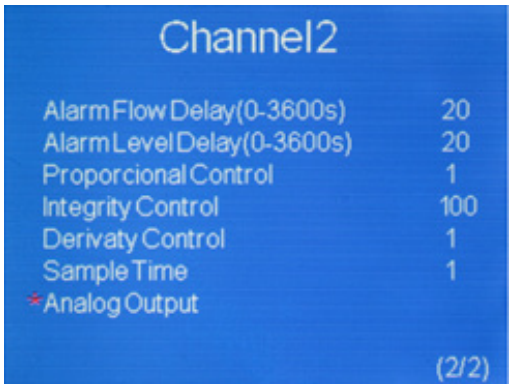
6.11 Configuration Channel 1 / 2

All settings concerning measurements and controls are adjusted in the Configuration menu.
Different analysis sensors can be connected to Channel 1 and Channel 2 for the measurement.









NOTE!

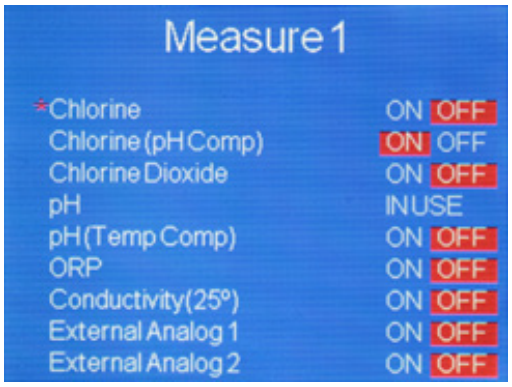
Channel 2 is only visible in the 2-channel version!

6.11.1 Analysis measurement definition

The type of analysis measurement is defined in the menu item Measure 1 / 2.

NOTE!

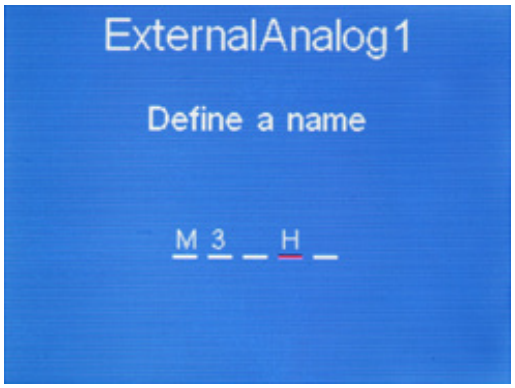
Measure 2 is only visible in the 2-channel version!

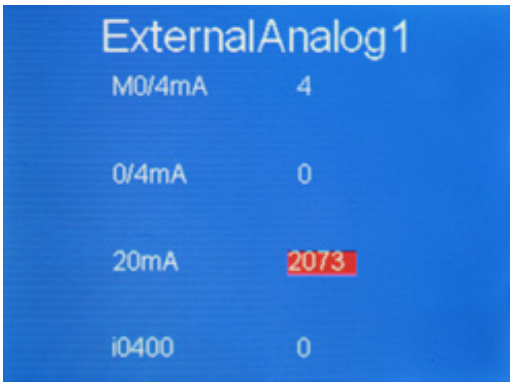


In addition to the standard measurements for chlorine (with and without pH compensation), chlorine dioxide, pH (with and without temperature compensation), redox (ORP) and conductivity, up to two analogue inputs are available as measurement inputs.

Additional settings are necessary when selecting an analogue input as measurement input:

- After selection of analogue input 1 or 2, a description for the display in the main menu must be selected. The description can consist of maximum 5 characters. The letters A to Z and the digits 0 to 9 are available for this.
- After entry of the description, the display values must be assigned to the input signal.





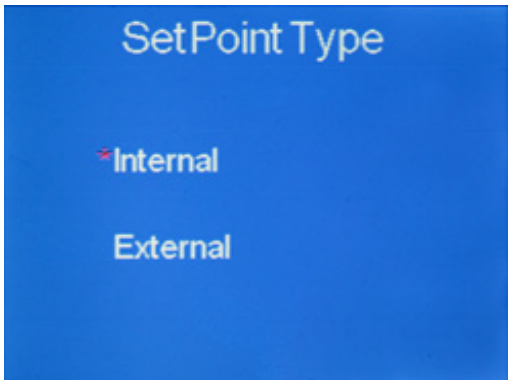
Example: Analogue signal 4..20mA corresponds to 0..14pH

Setting values:

M0/4mA	-> 4	(selection 0 or 4 mA)
0/4mA	-> 0	(min. measurement signal for 4 mA)
20mA	-> 14	(max. measurement signal for 20 mA)
I400	-> 0	(correction factor)

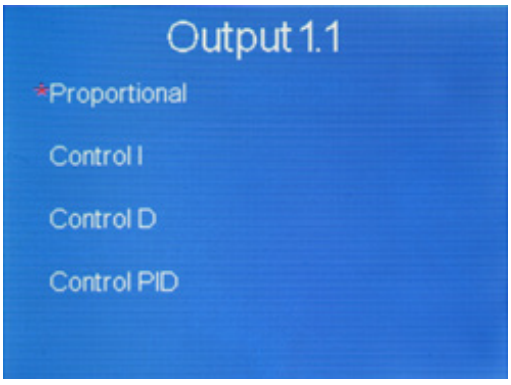
6.11.2 Set Point

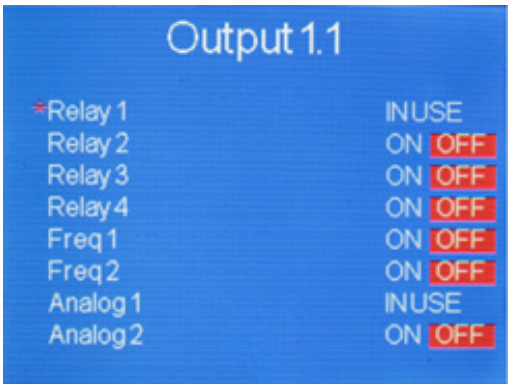
In this menu the setpoints can be activated and the selection between internal and external setpoint can be done. If external is selected, the assignment to an analogue input is performed automatically. The setpoint is then directly proportional to the applied mA signal. The adjustment of the analogue value is performed via the configuration of the analogue input.



6.11.3 Controller definition

The type of control and the assignment to the outputs are performed in the Outputs menu item. The types P, I, D or PID are available as controller. After selection of the controller, the assignment is made to the outputs RL1, RL2, RL3, RL4, P1, P2, AO1 and AO2. If any output is already occupied by a different function, this is indicated.





The outputs have the following functions:

- RL 1 / 2

The relays 1 and 2 can be operated in PWM mode or On/Off mode. The supply voltage (terminals 230 V AC) is switched to the relays here. Signals with a pulse width of 1..30 sec are produced in PWM mode. The length of the pulses here depends on the parameter setting. The On/Off mode is a pure limit value signal.

- RL 3 / 4

The functions of relays 3 and 4 are identical to those of relays 1 and 2. The difference here is potential-free output with the functions NO and NC.

- P1 und P2

These outputs are pulse frequency outputs. The maximum pulse frequency is 180 pulses/min and depends on the parameter setting. Direct actuation of dosing pumps with pulse inputs is possible.

- Analog 1 / 2

For assignment to the analogue outputs, these are configured as continuous action controllers. The function is influenced by the configuration of the control parameters.

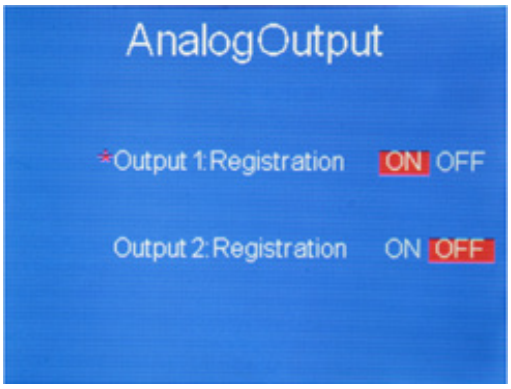
6.11.4 Definition of parameters for controller and outputs

The parameters described below can be configured for the controllers and outputs:

- Start delay (0…60 min)
  Delay with which the outputs become active after enable.
- Maximum dosing time (0...480 min)
  Max. time for which an output is active.
- Minimum output (0…100%)
  Selection of the minimum value with which an output operates.
- Maximum output (0…100%)
  Selection of the maximum value with which an output operates.
- Delay alarm flow rate (0…3600 sec)
  Time delay with which a flow rate alarm is signalled.
- Delay alarm fill level (0…3600 sec)
  Time delay with which a fill level alarm is signalled.
- Proportional controller
  Definition of the P proportion for the controller.
- Integral controller
  Definition of the I proportion for the controller.
- Differential controller
  Definition of the D proportion for the controller.
- Measuring time
  Definition of the sampling time for the PID controller.

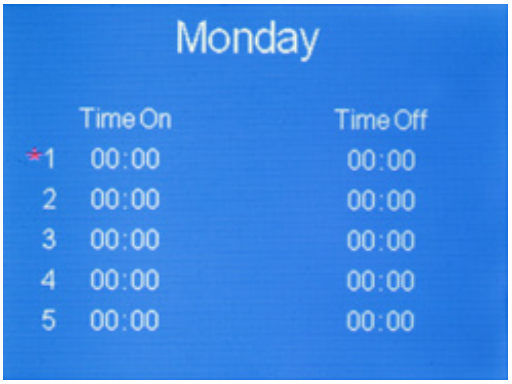
6.11.5 Analogue outputs (option)

Two analogue outputs are available for the display of the measured values from the analysis. These can be evaluated individually. The selection is not possible if the outputs are already occupied by another function (control).



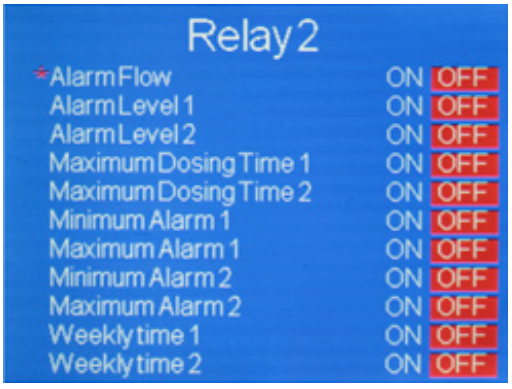
6.11.6 Weekly timer

Up to 2 weekly timers can be configured for the outputs. Up to 5 switching times are available for each day of the week. The time intervals are defined by a start time and an end time. After the intervals have been set, the assignment to the relay outputs is made using the menu *Relays*.



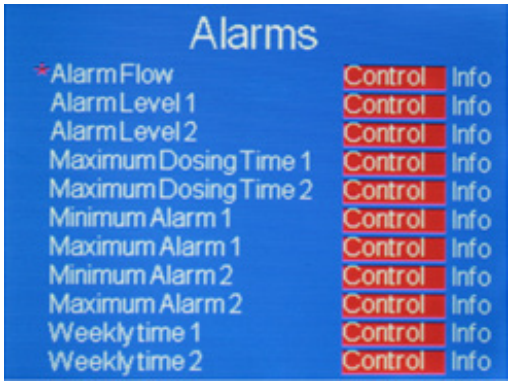
6.11.7 Relays

Alarm functions or a weekly timer can be assigned to the four output relays in the Relays menu. The selection is not possible if a relay is already occupied by another function.



6.11.8 Alarms

It is defined in the Alarms menu whether an alarm is only shown on the display of the measurement analyser or an active control is deactivated. If an output has been assigned to an alarm in the Relays menu, the signalisation persists in the event of a deactivation.



6.11.9 AUX-Funktion

It is possible with the AUX function to link two measured values and the resulting control with each other.

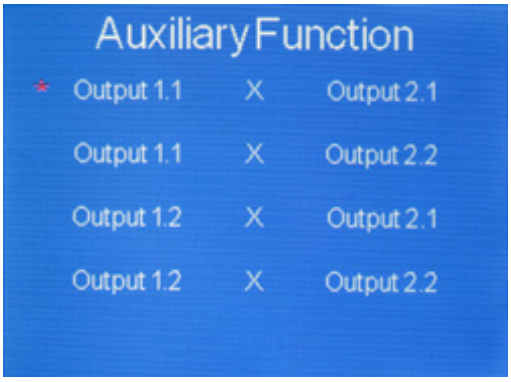
Example: Channel 1 flow rate measurement
Channel 2 chlorine measurement

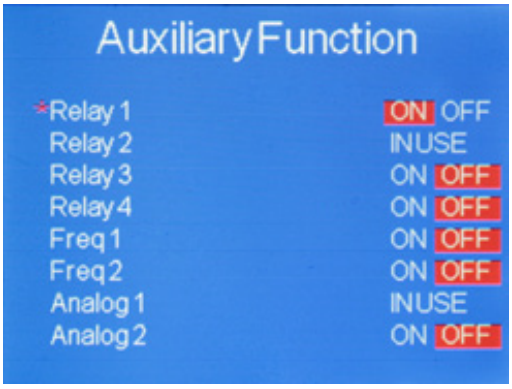
Link: $\frac{\%\text{Output Channel 1} \times \%\text{Output Channel 2}}{100}$

The result is the control of the chlorine value depending on flow rate.

NOTE!

This option is only available in the 2-channel version!





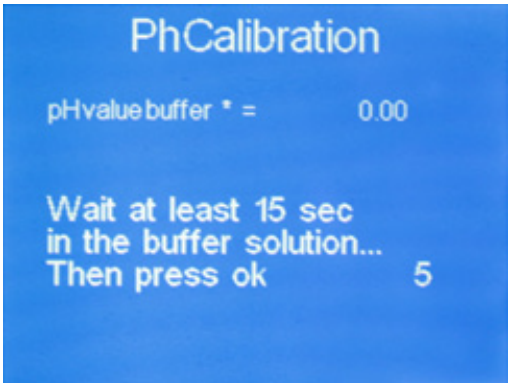
7. Calibration

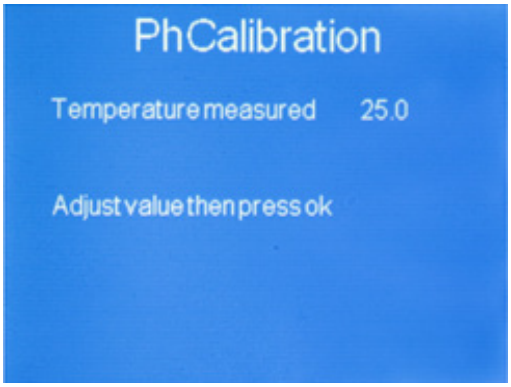
Calibration of the electrodes is of great importance for the faultless function of the measuring system. The calibration must be performed with each electrode individually. This is particularly important for pH-compensated chlorine measurement. If no stable values are measured during the calibration, this will be indicated by the measurement analyser with an appropriate message on the display.

7.1 pH-Sensor

Two buffer solutions are needed for the calibration: pH7 and a different solution from this, e.g. pH4. The following procedure is necessary:

- Clean sensor.
- Immerse sensor in the pH7 buffer solution and wait approx. 2 minutes until the display on the screen has stabilised.
- Activate the calibration in the Definitions menu and follow the instructions on the display.
- Once the calibration with pH7 has completed, clean the sensor again and immerse in the second buffer liquid and wait 2 minutes until the instructions on the display are followed.
- After input of the pH values, the calibration is completed and the sensors are calibrated.





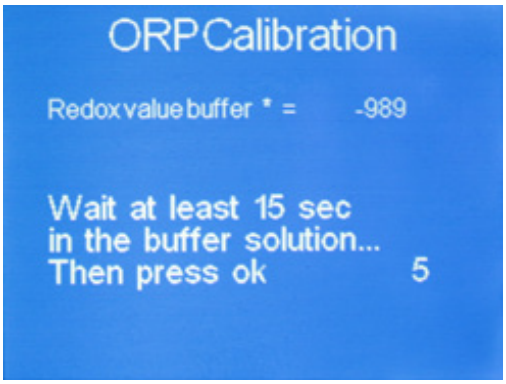
Two types of errors can occur during the calibration:

- The message PH7 ERROR error occurs during the routine with pH7 if any deviation of more than 0.5 pH is measured.
- The message GAIN ERROR occurs during the routine with the second buffer liquid if any deviation of more than 0.5 pH is measured.

7.2 Redox-Sensor

A buffer solution whose redox value is not 0 mV is needed for the calibration. The following procedure is necessary:

- Clean sensor.
- Immerse sensor in the buffer solution and wait approx. 2 minutes until the display on the screen has stabilised.
- Activate the calibration in the Definitions menu and follow the instructions on the display.
- Enter the value of the buffer solution when the measurement has completed.
- The calibration is completed after confirmation.

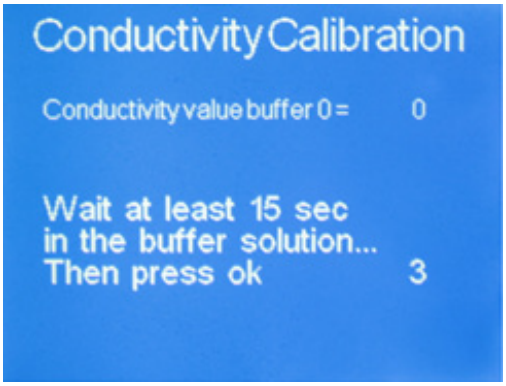


If the difference between the entered and measured value for the calibration is greater than 400 mV, the process has failed and must be performed again.

7.3 Conductivity sensor

A buffer solution whose conductivity value is not 0 mS is needed for the calibration. The following procedure is necessary:

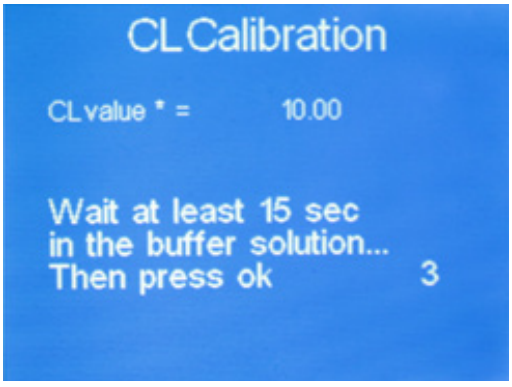
- Clean sensor.
- Operate sensor without buffer solution / measuring liquid.
- Activate the calibration in the Definitions menu and follow the instructions on the display.
- Immerse sensor in the buffer solution and follow the instructions on the display.
- The calibration is completed after confirmation.



7.4 Chlorine sensor

The calibration of a chlorine or chlorine dioxide sensor requires the determination of the respective measured value using a reference method (e.g. DPD, titration).
The following procedure is necessary:

- Clean sensor.
- Immerse sensor in measuring liquid.
- Note stabilising time of the sensor and follow the instructions on the display.
- Take sample of the measuring liquid directly at the measuring point and determine the ingredient using the reference method.
- Enter the value of the reference measurement when the stabilising time has elapsed.
- The calibration is completed after confirmation.



8. Maintenance and cleaning

The measurement analyser does not require any maintenance. Clean with a moist cloth. Rub dry afterwards.

ATTENTION!

Do not use any solvents! These can attack the surfaces!

9. Decommissioning

- Disconnect device from the power supply.
- Detach electrical connections.
- Shut down equipment.

ATTENTION!

Only let the decommissioning of the measurement analyser be performed by authorised and qualified personnel!

10. Disposal

Dispose of correctly and comply with the currently applicable local regulations after shutdown and dismantling.

ATTENTION!

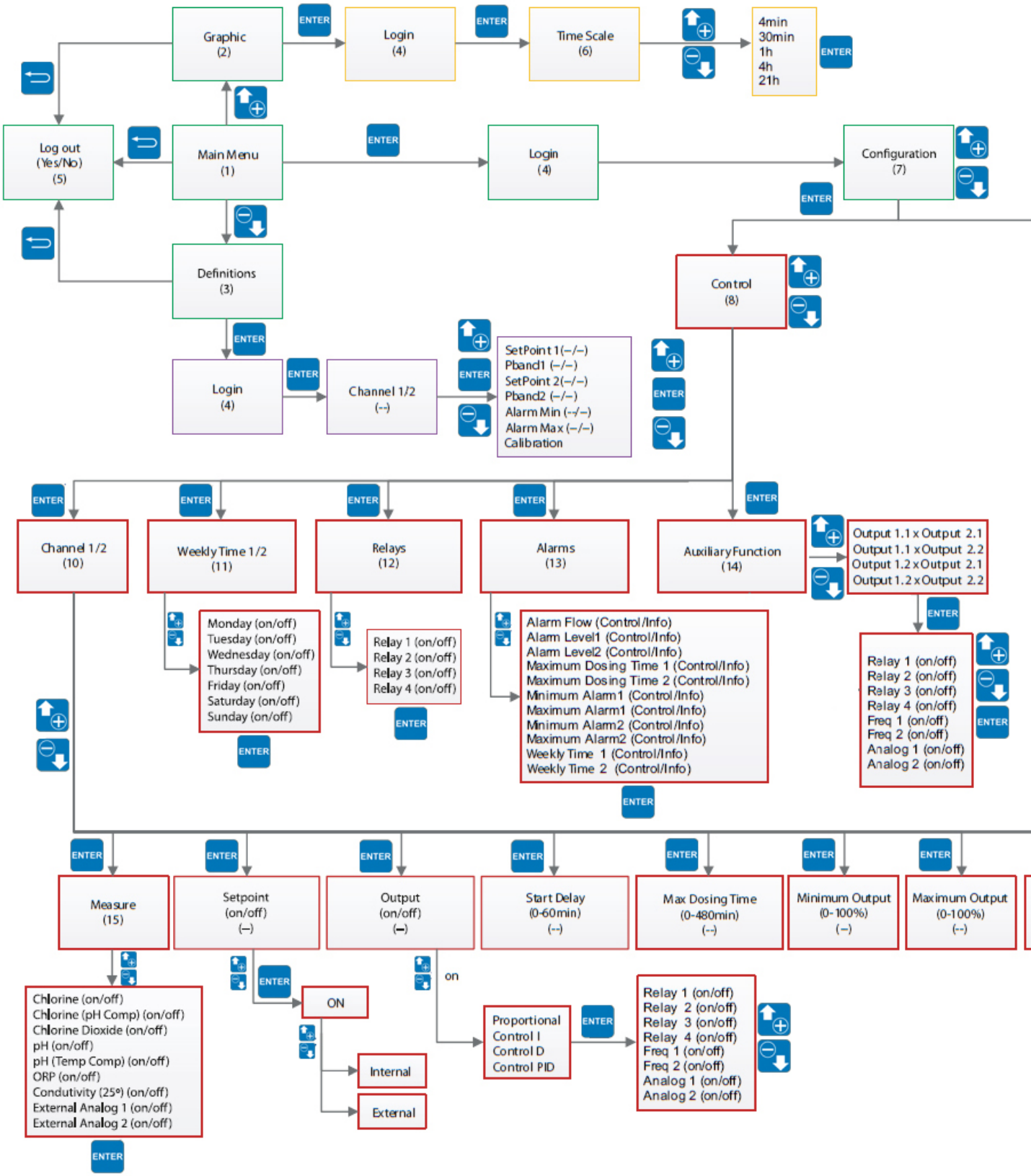
Electronics waste is hazardous waste!

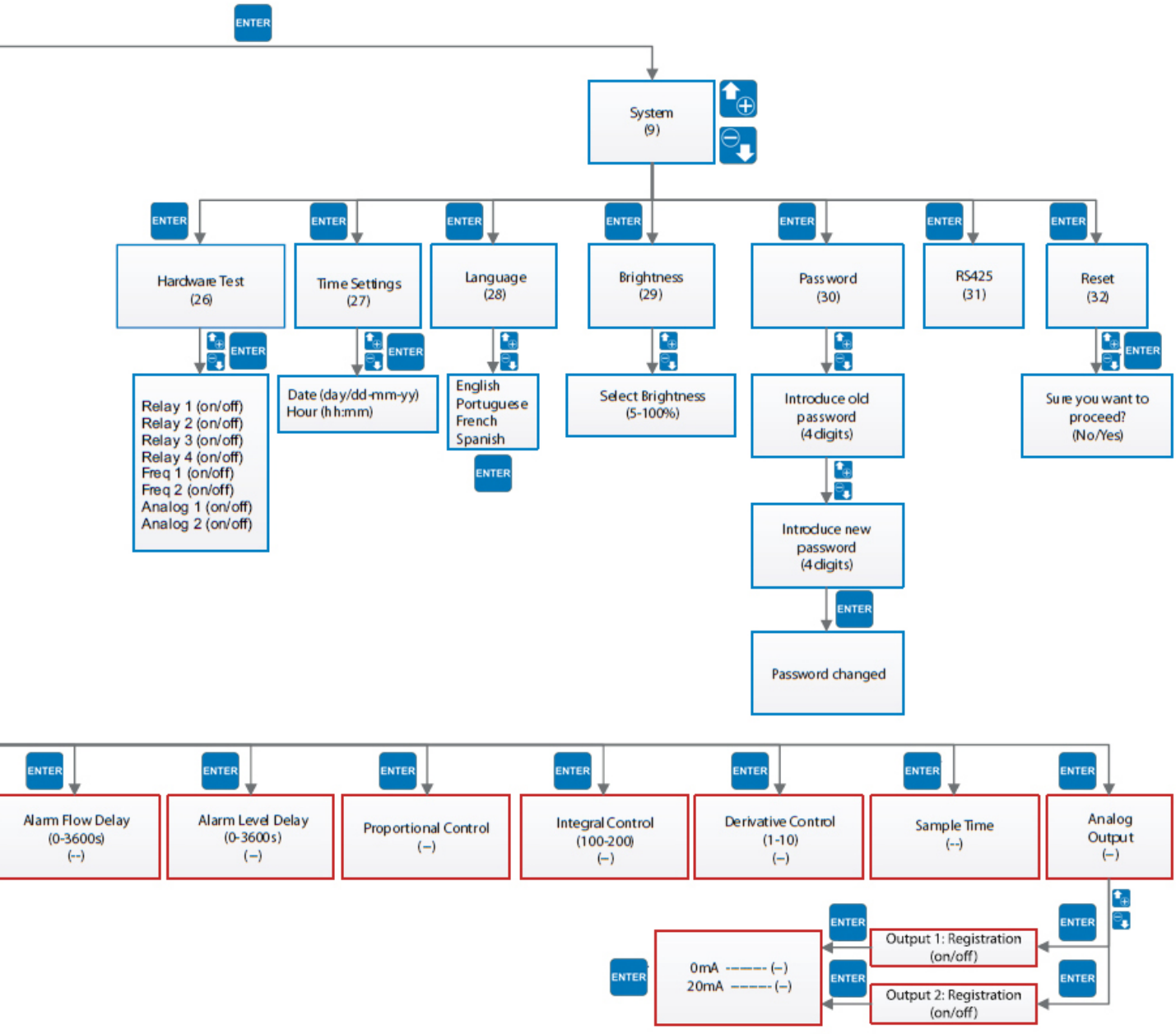
11. Setting values

Parameter	Factory settings	Customer settings

Notes

12. Appendix - Menu structure




ENTER
System
(9)
Hardware Test
(26)
Time Settings
(27)
Language
(28)
Brightness
(29)
Password
(30)
RS425
(31)
Reset
(32)
Relay 1 (on/off)
Relay 2 (on/off)
Relay 3 (on/off)
Relay 4 (on/off)
Freq 1 (on/off)
Freq 2 (on/off)
Analog 1 (on/off)
Analog 2 (on/off)
Date (day/dd-mm-yy)
Hour (h h:mm)
English
Portuguese
French
Spanish
Select Brightness
(5-100%)
Introduce old
password
(4 digits)
Introduce new
password
(4 digits)
Password changed
Sure you want to
proceed?
(No/Yes)
Alarm Flow Delay
(0-3600s)
(--)
Alarm Level Delay
(0-3600s)
(--)
Proportional Control
(--)
Integral Control
(100-200)
(--)
Derivative Control
(1-10)
(--)
Sample Time
(--)
Analog
Output
(--)
Output 1: Registration
(on/off)
Output 2: Registration
(on/off)
0mA ------ (--)
20mA ------ (--)