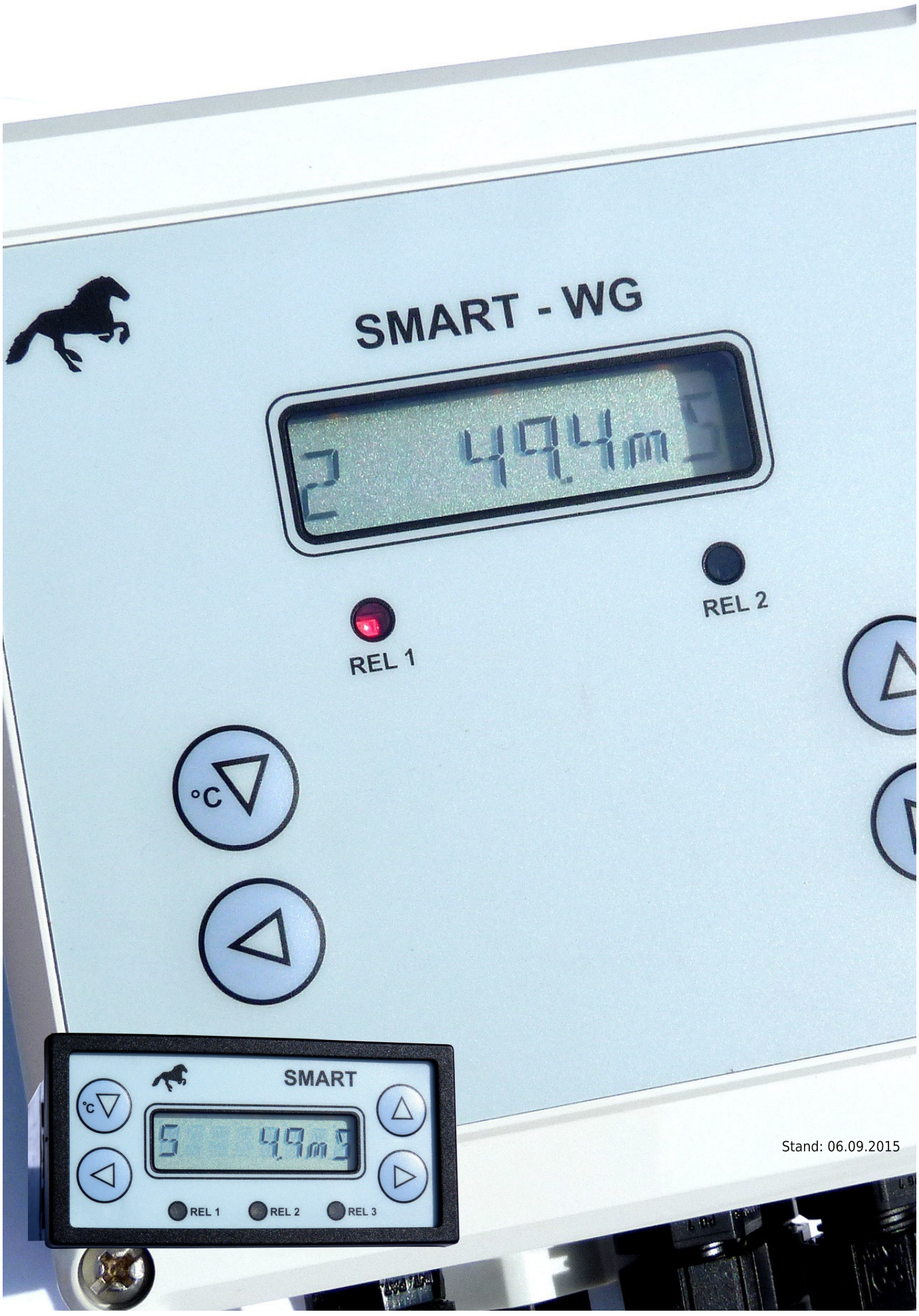
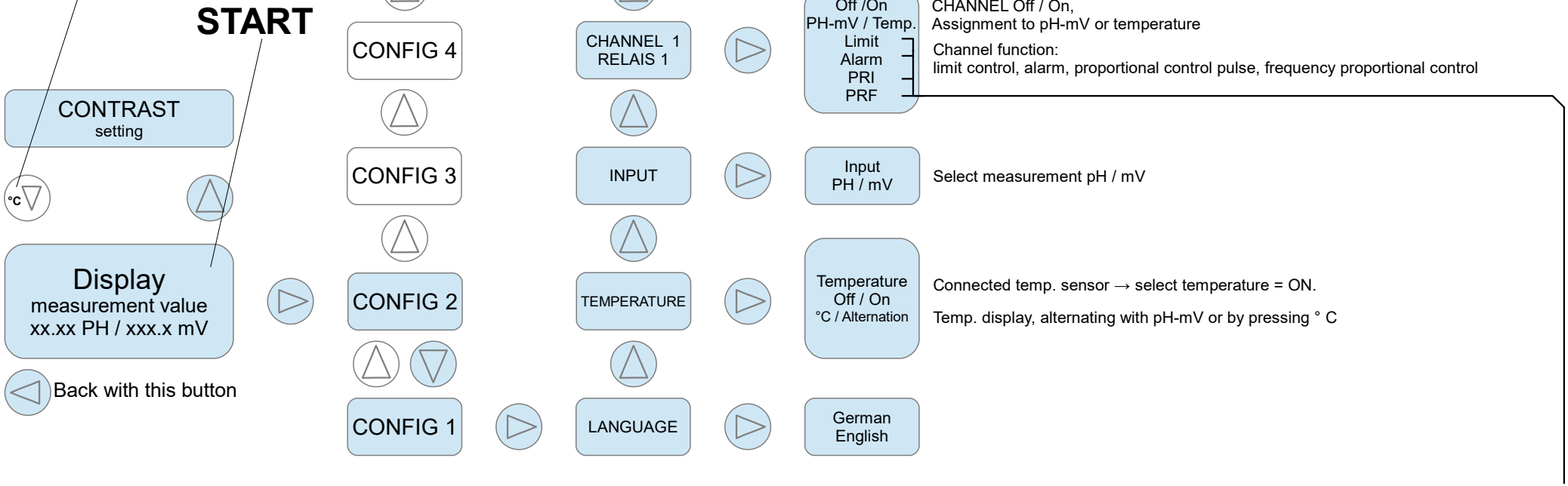
Instruction manual SMART 96-2 / WG-2 pH



Stand: 06.09.2015

SMART 96-2 / WG-2 pH / mV
Instructions for Installation

Configuration CONFIG 1



Here the assignment is defined, whether the pH value or the temperature is output, whether the output should be 0... or 4...20mA, whether the 20mA are assigned to the high value, or the low value. E.g., the measuring range should be from 5..10pH, (The measuring range is set in configuration 2.) then it can be assigned whether 20 mA are output at 5pH and 0 (4) mA at 10pH. (Inverse). Or whether 0 (4) mA at 5pH and 20 mA at 10pH are output.

Current output 0/4 ... 20mA, assignment to pH-mV or temperature

We recommend, to activate the alarm in CHANNEL 3, if it is possible.

CHANNEL Off / On,
Assignment to pH-mV or temperature

Channel function:
limit control, alarm, proportional control pulse, frequency proportional control

Select measurement pH / mV

Connected temp. sensor → select temperature = ON.

Temp. display, alternating with pH-mV or by pressing ° C

Configuration of the channels and control functions

CONFIG 2

Off delay

On delay

in Seconds

For the alarm function is the relay function inverted.

The alarm will be stored and can be reseted with any key. By relais off, all relais are switched off in case of alarm.

For PRI / PRF will be regulated between the Setpoints of ↓ 0 and ↑100%

CONFIG 5	ANALOG 2	RELAIS Duration / wiper	RELAIS auto / off	I-Control Off / On	I-Control Off / On	
CONFIG 4	ANALOG 1	HYSTERESE ↓↑	SIGNAL on / off	Max. DOSAGE↓↑	Max. DOSAGE↓↑	
CONFIG 3	CHANNEL 3	LIMIT ↓	ON DELAY in min.	PERIOD-DURATION T in sec.	FREQUENCY in Hz	
CONFIG 2	CHANNEL 2	HYSTERESE ↑↓	LIMIT ↓	SETPOINT ↓	SETPOINT ↓	
CONFIG 1	CHANNEL 1	LIMIT ↑	LIMIT ↑	SETPOINT ↑	SETPOINT ↑	

Display
measurement value

Back with this button

LIMIT FUNCTION — ALARM — PRI — PRF

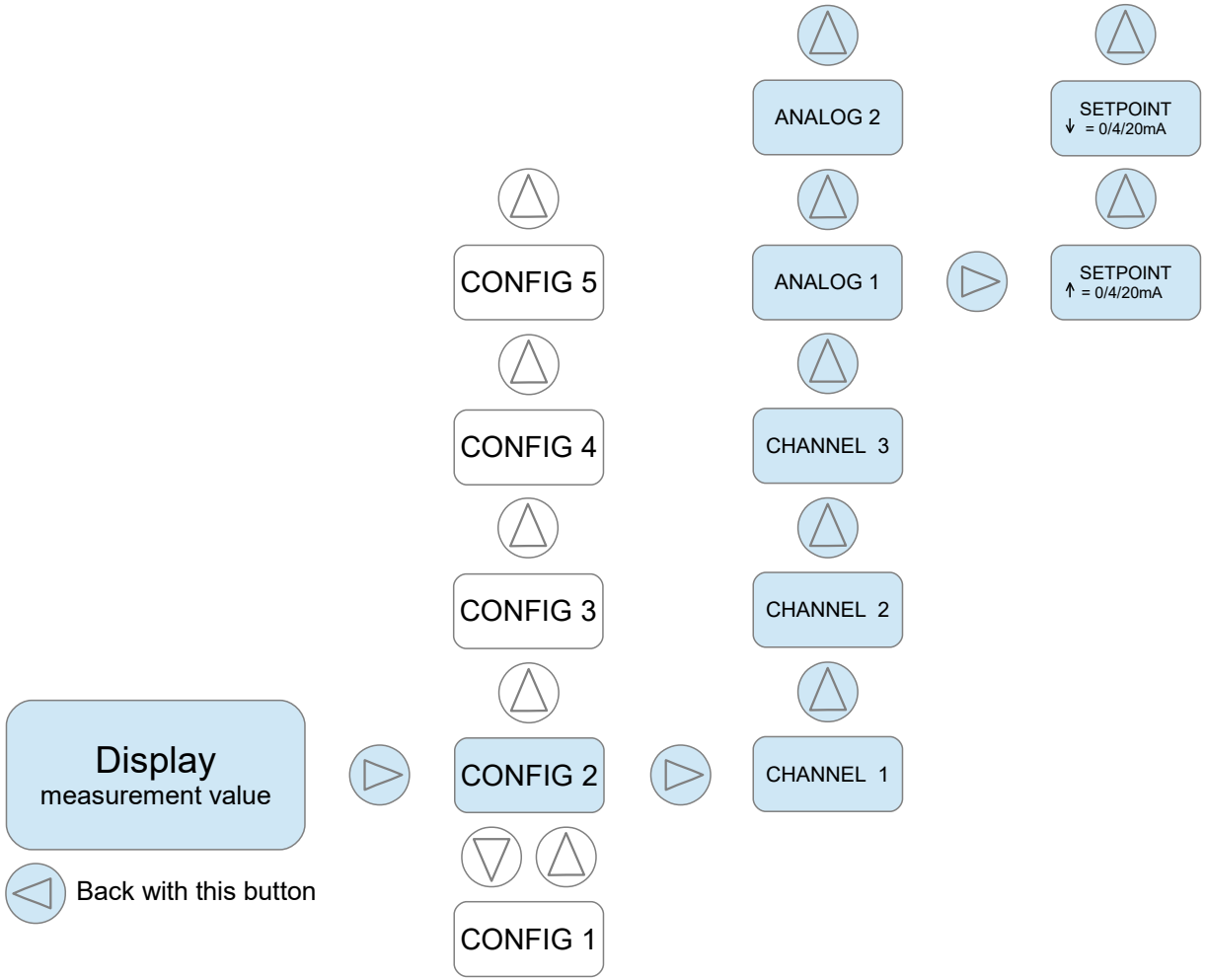
Ex.

LIMIT: 6.00 ↑ R1
means, if it exceeds 6:00 relay 1 is turned on.

Hysterese: HY↑ 0.10↓
means when falling under 5.90 Relay 1 is switched off again.

Configuration of the Analog Channels 0 / 4...20mA

CONFIG 2



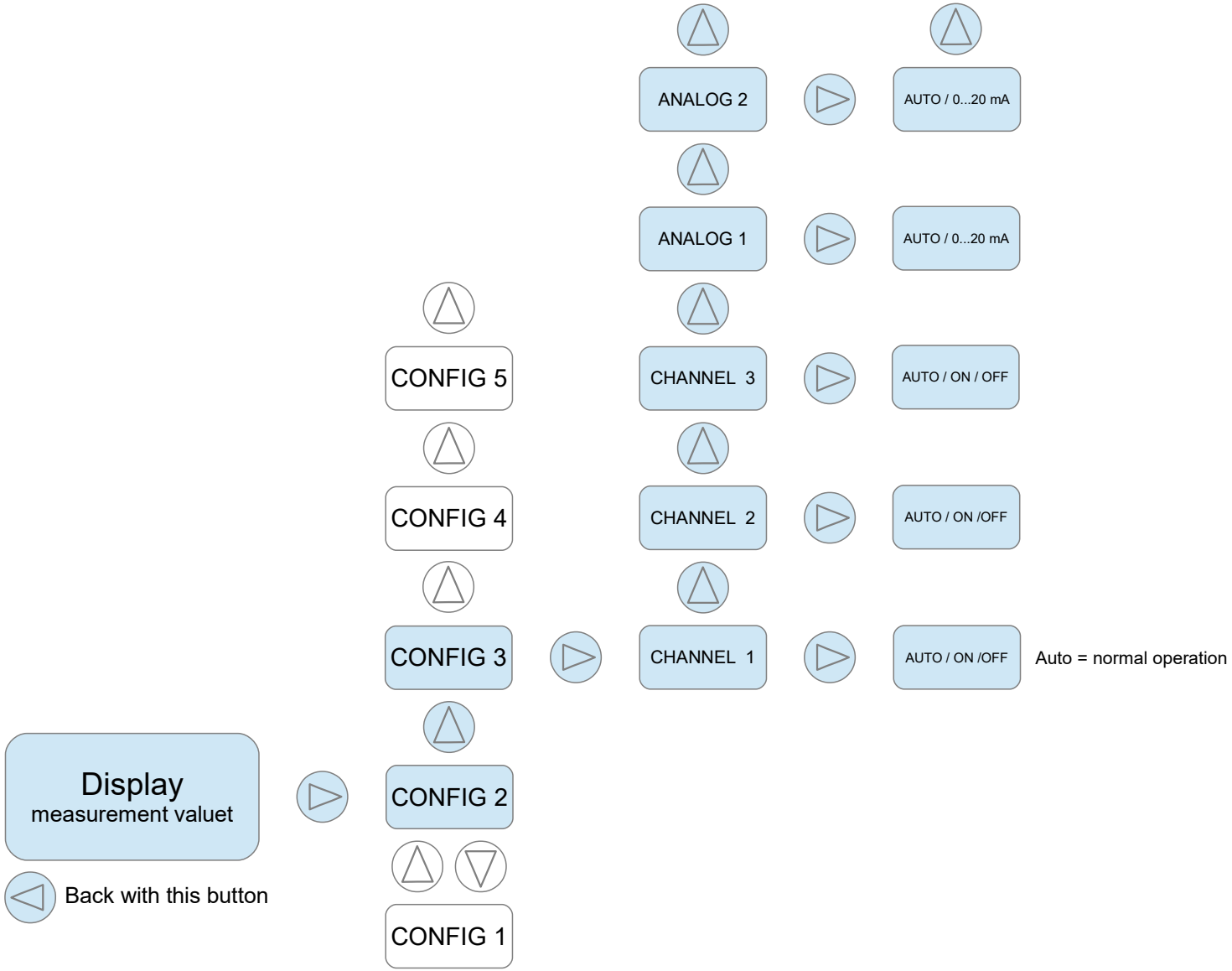
Here the measuring range is defined, the assignment of the pH value to the output current, e.g. 3...10pH = 4...20mA

In Config 1 is determined whether the max. current of 20mA is reached at setpoint high or low.

SIMULATOR

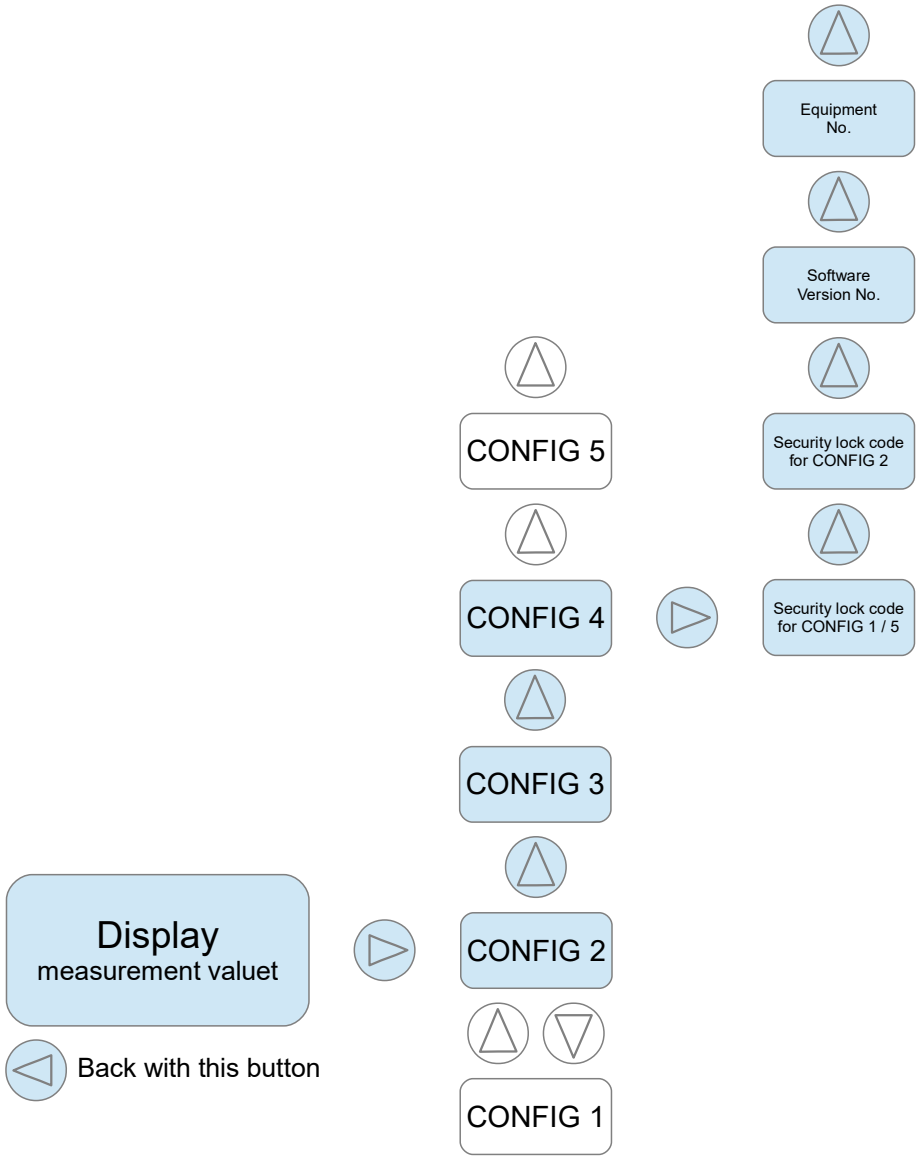
The simulator will terminated automatically after 30min. after the last keystroke.
When returning of CONFIG 3, all channels are set to normal operation (AUTO).

CONFIG 3



Security lock code by assignment

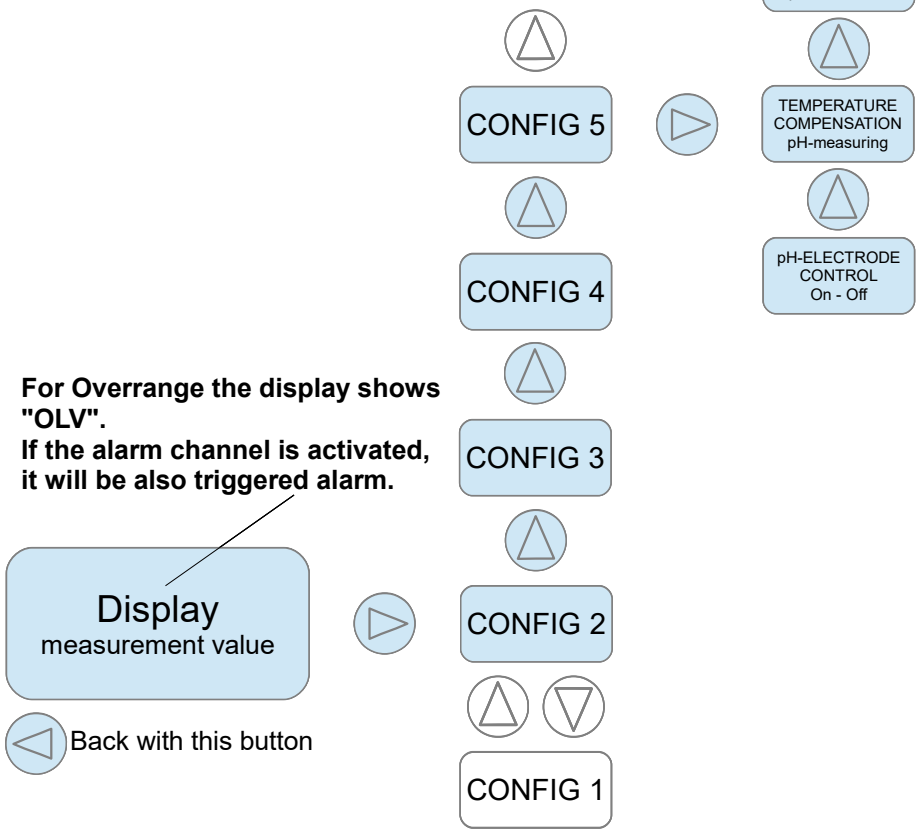
CONFIG 4



For first time code entry or code change must always first the current code to be entered, then the new code.
Current code at delivery of the device: 0000

Configuration for the pH measurement and pH calibration

CONFIG 5



For Overrange the display shows "OLV".
If the alarm channel is activated, it will be also triggered alarm.

Buffer of pH 9 ... 13 can be entered and are automatically recognized during calibration.

Buffer of pH 1 ... 5 can be entered and are automatically recognized during calibration.

Buffer of pH 6.80 ... 7.02 can be entered and are automatically recognized during calibration.

If problems occur with the automatic buffer recognition it should be started with the buffer for zero.

For short circuit or interruption of the temperature sensor on the display appears **PT. FAIL.** ↓ or ↑
if the alarm channel is activated, ALARM will be triggered.

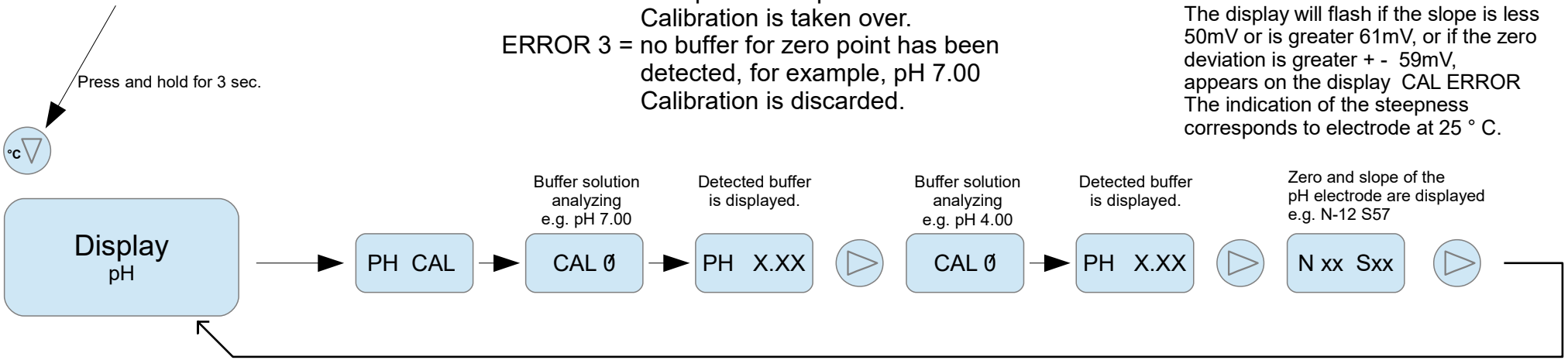
Should be a cable break or glass breakage or short circuit of the connecting cable, will be displayed **EL ERROR** ↑ or ↓
if the alarm channel is activated, ALARM will be triggered.

Calibration pH / mV

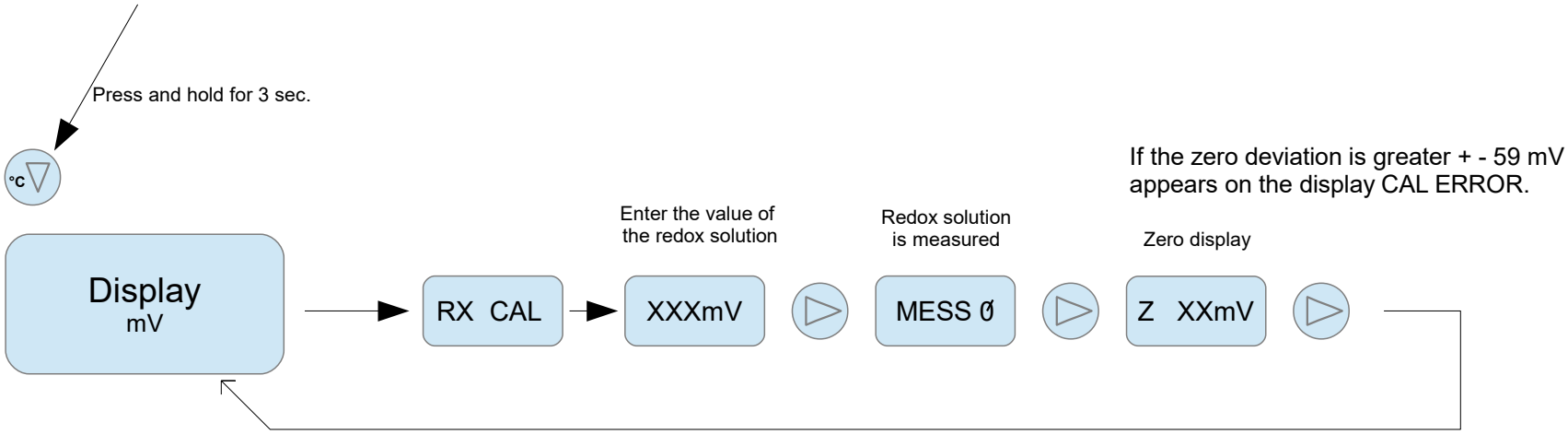
ERROR 1 = 2x same buffer recognized
Calibration is discarded.
ERROR 2 = zero point or slope failure
Calibration is taken over.
ERROR 3 = no buffer for zero point has been
detected, for example, pH 7.00
Calibration is discarded.

The display will flash if the slope is less 50mV or is greater 61mV, or if the zero deviation is greater + - 59mV, appears on the display CAL ERROR
The indication of the steepness corresponds to electrode at 25 ° C.

Entry into calibration routine for pH



Entry in calibration routine for redox



If the zero deviation is greater + - 59 mV appears on the display CAL ERROR.

Safety Guidelines

All information concerning hazards when using the device must be observed.

For any damage or outages resulting from non-compliance with the operating instructions result, we assume no liability.

Before connecting the device to the mains, make sure,
that voltage value (V) (AC or DC) match with the information on the
Type plate of the appliance.

The device is designed for mounting in control panels, cabinets or wall-mount enclosure provided and must be operated only in installed condition.

There must be no covers removable by hand are used,
whose removal permits contact with hazardous voltages.

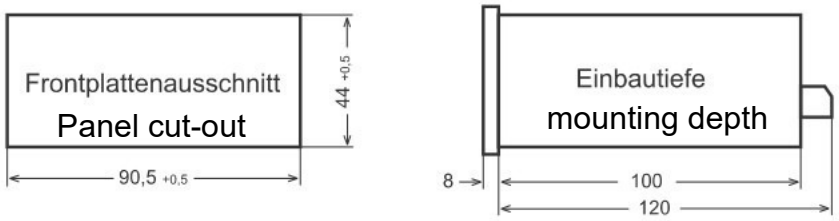
According to DIN / VDE 0411 the power supply for the device must have a
Power switch, who can be switched off with two contacts.

Any repair or replacement of parts may only be carried out by an expert, which is familiar with the associated risks and the VDE regulations .

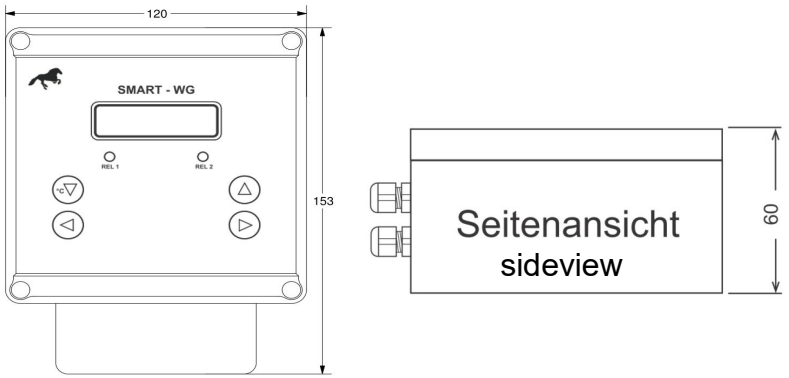
The unit conforms to Protection Class 1, constructed in accordance with DIN / VDE 0411 and has the factory end and duration tested in good working condition leaving.

This device complies with the requirements of the EMC Directive (89/336 / EEC),
the Low Voltage Directive (73/23 / EEC) and the Machinery Directive (89/392 / EEC).
It was designed and tested in accordance with the standards listed below:
DIN EN 61010-1, DIN EN 50081-1, DIN EN 50082-1

Installation dimensions: SMART 96-2



Dimensions: SMART WG2



Data Sheet (technical alterations reserved) SMART 96-2 / WG-2 pH/Redox

pH/Redox

Range: 0,00 ... 14,00 pH / ±1200 mV (Redox)
Accuracy: 0,02 pH / 2 mV
Input impedance >10^{12}Ohm
- Electrodes and cable monitored for short circuit, break and glass breakage.

Measurement inputs to the device electrically isolated.

Temperature

Range: -20,0 ... 110,0°C
Accuracy: +- 0,5°C
Sensor: Pt100 in 2- or 3-wire circuit
- Cable break and short-circuit monitoring

Outputs:

3 potential- free relay contacts (switch):
250VAC / 8A resistive load
can be assigned as desired,
configurable as:

Rel. 1...3 - LIMIT: limit switch
Rel. 3 - Alarm: monitoring
Rel. 1...3 - PRI: proportional pulse duration control
Rel. 1...3 - PRF: proportional pulse frequency control

LIMIT: limit switch adjustable:

- possible switching characteristic: ⌐¬ / ¬⌐ / ⌐¬⌐
- permanent or pulse contact
- switching delay 0 ... 9999 sec.
- switching hysteresis: 0 ... 200 Digit

Alarm: monitor adjustable:

- optical signal
- acoustic signal
- time delay 0,1 ... 30 min.
- manual reset

PRI: proportional pulse duration control adjustable:

- integral component switchable
- cycle time 4 ... 120 sec.

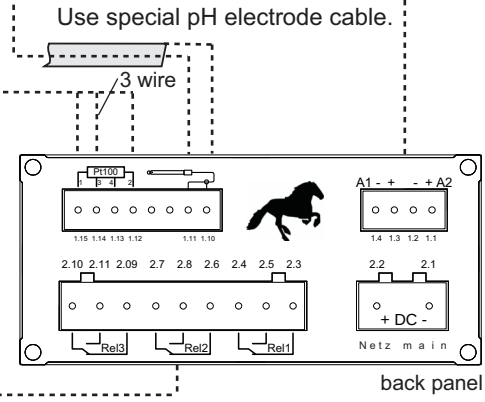
PRF: proportional pulse frequency control adjustable:

- integral component switchable
- pulse frequency: 0 ... 3 Hz
- pulse duration: 170 ms fixed

Splash-proof front foil
Backlight display
Article number: **1300.0301**

2 Analog outputs

- Standard signal 0/4 ... 20mA
- 0 ... 5V/10V by parallel connection of a 250/500 Ohm resistor
- Freely allocate the display value
- Maximum burden: 500 Ohm



back panel

Operating voltage: 85 ... 264 VAC 50 / 60Hz
No. 1300.0301

9 ... 36V DC
No. 1300.0301.DC

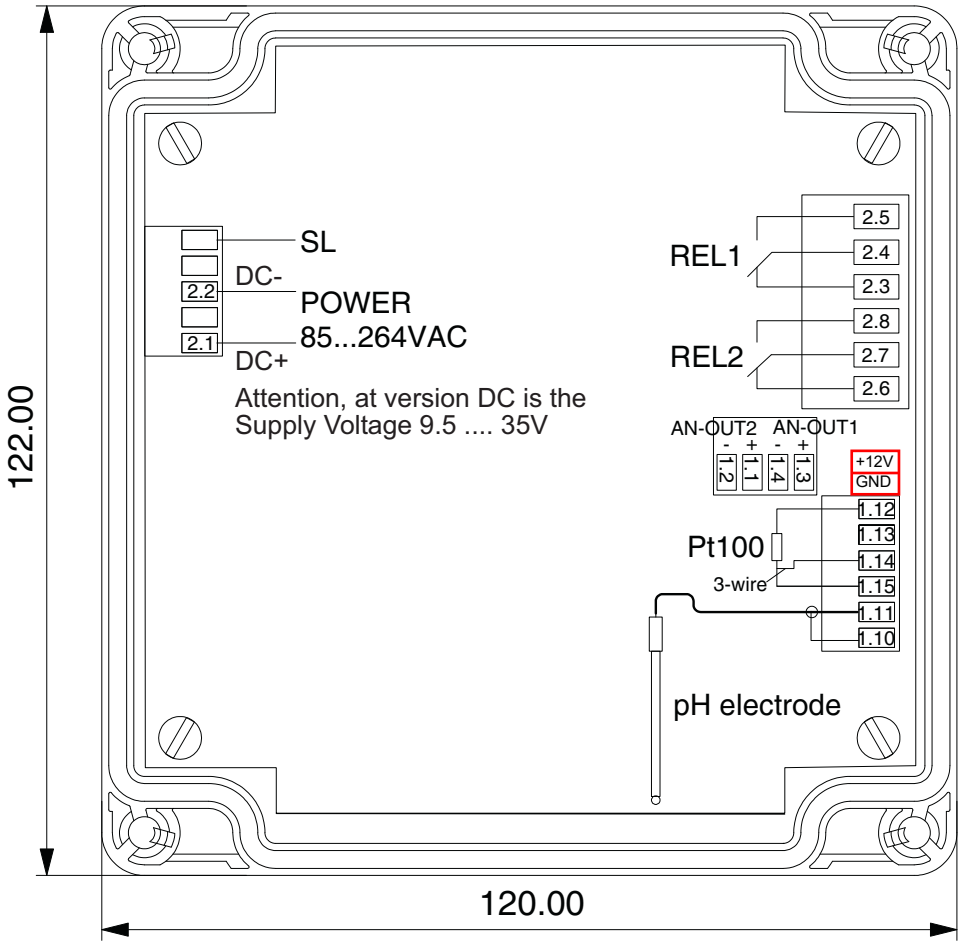
Power consumption: <5 VA
Ambient temperature: 0 ... 50 ° C
Housing: mounting housing to DIN 43 700
Material: flame retardant Noryl

Front size: 48 x 96 mm
Panel cut-out 44.0 x 90.5 mm
Mounting depth: 120 mm
Connections: Screw
Weight: 350g

Climatic conditions: rel. Humidity <75% without condensation
Electrical safety: to EN 61 010
Clearance and creepage distances for
- Overvoltage category II
- Pollution degree 2

Protection class: 1
Protection: to EN 60 529
Front: IP65

Electromagnetic compatibility:
according to NAMUR recommendation NE21,
EN 50 081 Part 1, EN 50 082 Part 2



At SMART WG-2 is the
3.Relais not implemented.

Operating voltage: 85 ... 264 VAC 50 / 60Hz
No. 1300.2301

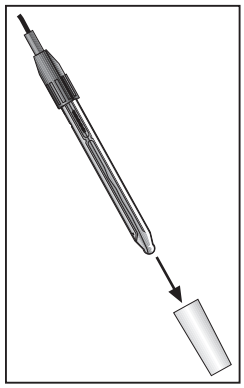
9 ... 36V DC
No. 1300.2301.DC..

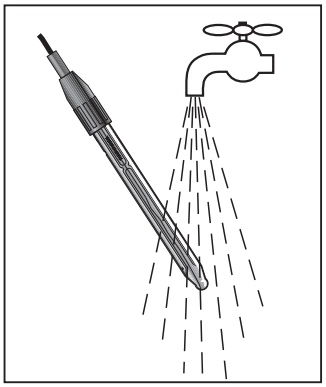
..
Power consumption: <5 VA
Ambient temperature: 0 ... 50 ° C
Housing: Wall mounting housing
Material: ABS
Dimensions: 120 x 122 x 60 mm
Connections: Screw
Weight: 450g

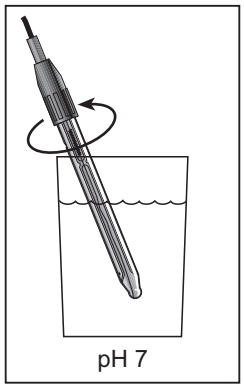
Climatic conditions: rel. Humidity <75% without condensation
Electrical safety: to EN 61 010
Clearance and creepage distances for
- Overvoltage category II
- Pollution degree 2
Protection class: 1
Protection: to EN 60 529
Front: IP65

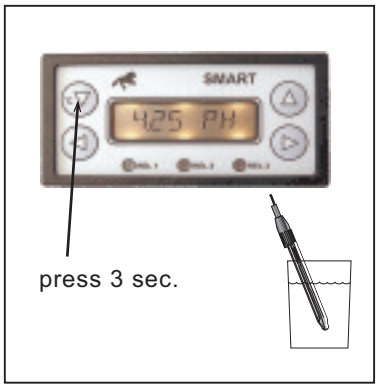
Electromagnetic compatibility:
according to NAMUR recommendation NE21,
EN 50 081 Part 1, EN 50 082 Part 2

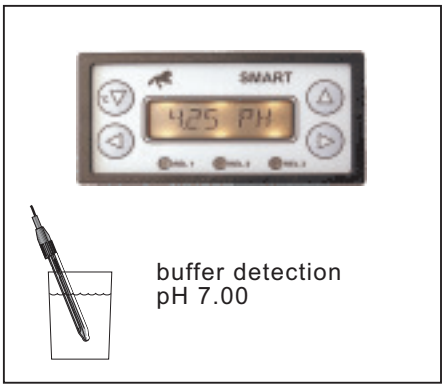
QUICK GUIDE pH CALIBRATION

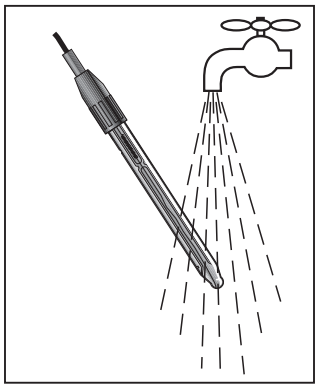


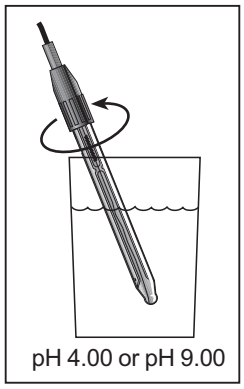


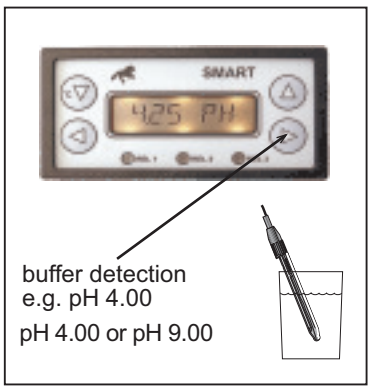


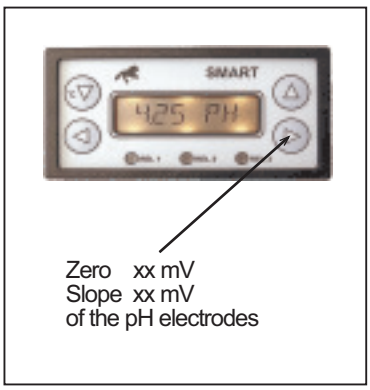


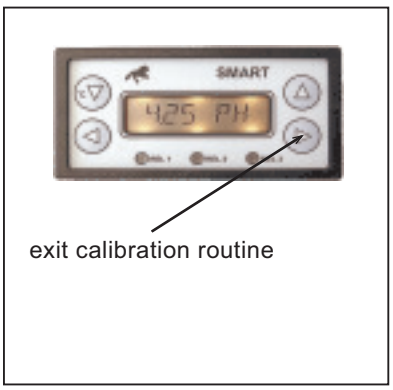










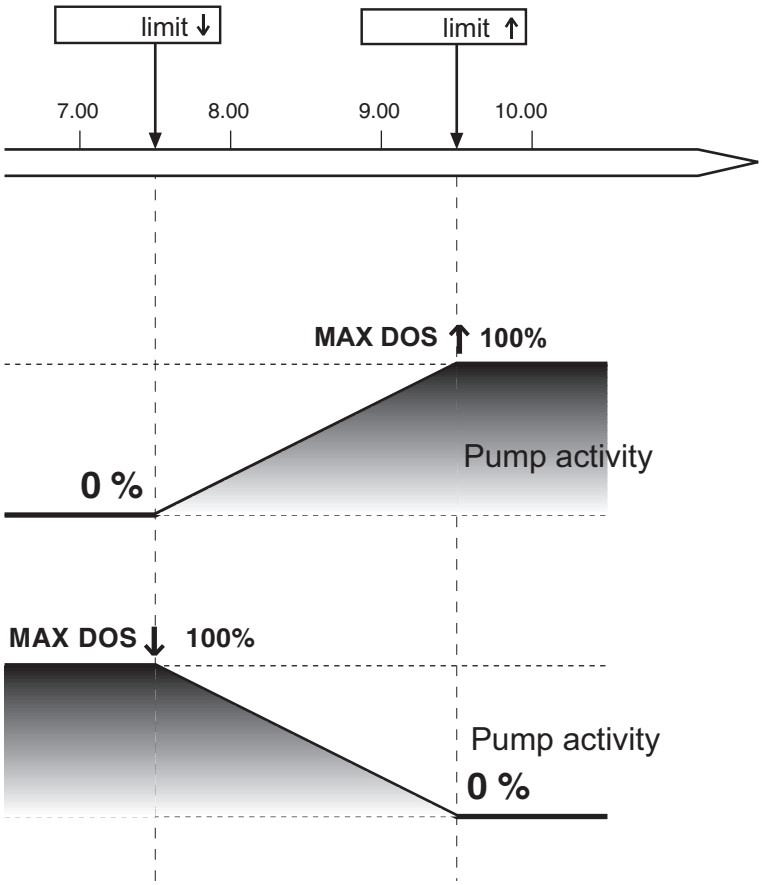


Measurement			
Trouble	Possible causes	no	notices
Wrong measuring value	Electrode is not connected correctly	M1	Control the connection of the electrode clamp 1.10 ← shielding clamp 1.11 ← inner conductor Open the shielding and remove the black, semiconductive sheath completely. (Avoid finger prints on the inner isolation)
	pH cable faulty	M2	Use only special pH electrodes cable. Avoid piecing, protect against moisture. Do not bend the cable strongly.
	System isn't calibrated with the electrode	M3	Calibrate the system according to “SHORT INSTRUCTION PH-CALIBRATION”
	Temperature compensation is not set correctly	M4	Pt100 on clamp 1.15 + 1.12 (with 3 wires in addition to sense connection to 1.14) Config 1 on, Config 5 TKM = Auto clamp 1.15 +1.12 open Config 1 off, Config 5 TKM enter medium temperature
Calibration error flashing signal after calibration	Electrode dirty or faulty (resp. spent)	M5	Check electrode for soiling or glass breakage Clean or replace it. Avoid moisture in the plug head
	Buffer solutions are not set correctly	M6	Always use a buffer solution for zero point and slope
		M7	Adjusting the available buffer solutions under Config 5: CN zero as (Standard pH 7.00) CS slope as (Standard pH 4.00) CS slope as (Standard pH 9.00)
	Buffer solutions old and soiling	M8	Change buffer solutions
	Temperature compensation is not set correctly	M9	Pt100 on clamp 1.15 + 1.12 (with 3 wires in addition to sense connection to 1.14) Config 1 on, Config 5 TKC = Auto clamp 1.15 +1.12 open Config 1 off, Config 5 TKC enter temperature of the buffer solution
EL error ↑	break	M10	pH electrode spent or cable is broken.
EL error ↓	short circuit	M11	Glass breakage or cable short circuit or moisture in the plug or cable.
pH / mV display alternates with temperature display	Display on exchange set	M12	Select Config 1 Temp. ° C button.

Relay outputs

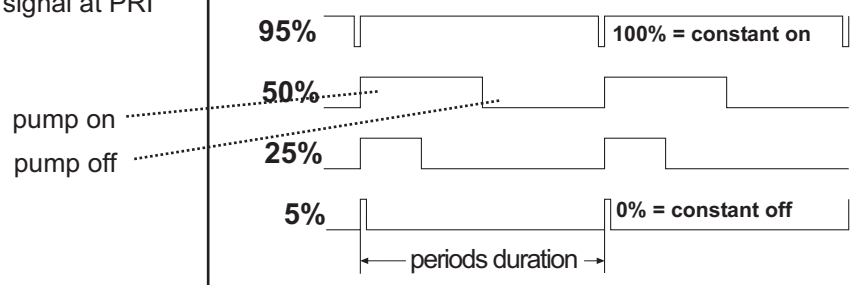
Trouble	Possible causes	no	notices
Limit can not be set	The limits cross	R1	In each channel, an upper and a lower limit are set. It should be noted that the upper limit ↑ is higher set as the lower limit ↓, or not required limit is turned off. (See the configuration examples)
Relay switches not on, off or uncontrolled	Channel don't switch	R3	Control Config 1 or Config 2 channel.
	Limit is not set correctly	R4	Control limits: ↑ means: When exceeded, the relay is active. ↓ means: When falling below the relay is active.
	Wrong fonction chosen	R5	Config 1 or 2 **GW**: Limit **PRI**: Proportional pulse width control **PRF**: Proportional frequency control **Alarm**: Alarm (beep on / off)
	Relay set to pulse contact instead of permanent contact	R6	Config 2 **Duration** set The relay remains active during the limit exceeding or **PULSE** set The relay operates when a limit is exceeded briefly and then falls off again
	On or Off delay set	R7	Config 2 **T.E.V.** switch-on delay **T.A.V.** switch-off delay *(values in seconds)*
	Upper with lower limit reversed	R8	**GW ↑** The relay switches on when exceeding the set limit, and turns off when falling below the set limit value including the hysteresis set.
	Lower with upper limit reversed	R9	**GW ↓** The relay switches on at falling below the set limit, and turns off when exceeding the set limit including the hysteresis set.
	Alarm time delay is set incorrectly	R10	Config 2 **T.D.** (in minutes)
	PRI/PRF	R11	Look at page proportional control
	Integral component	R12	Config 2 Only important to eliminate constant P-deviation, as at pH measurement at continuous neutralization.

Proportional Control (PRI / PRF)



PRI = Proportional pulse width control
PRF = Pulse frequency proportional control

Output signal at PRI

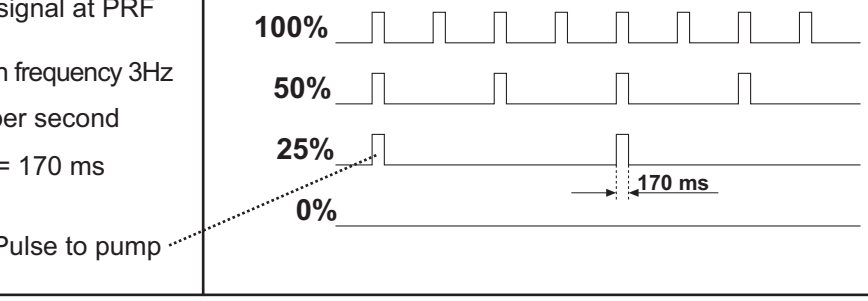


Output signal at PRF

Maximum
Pulse repetition frequency 3Hz

Hz = pulses per second

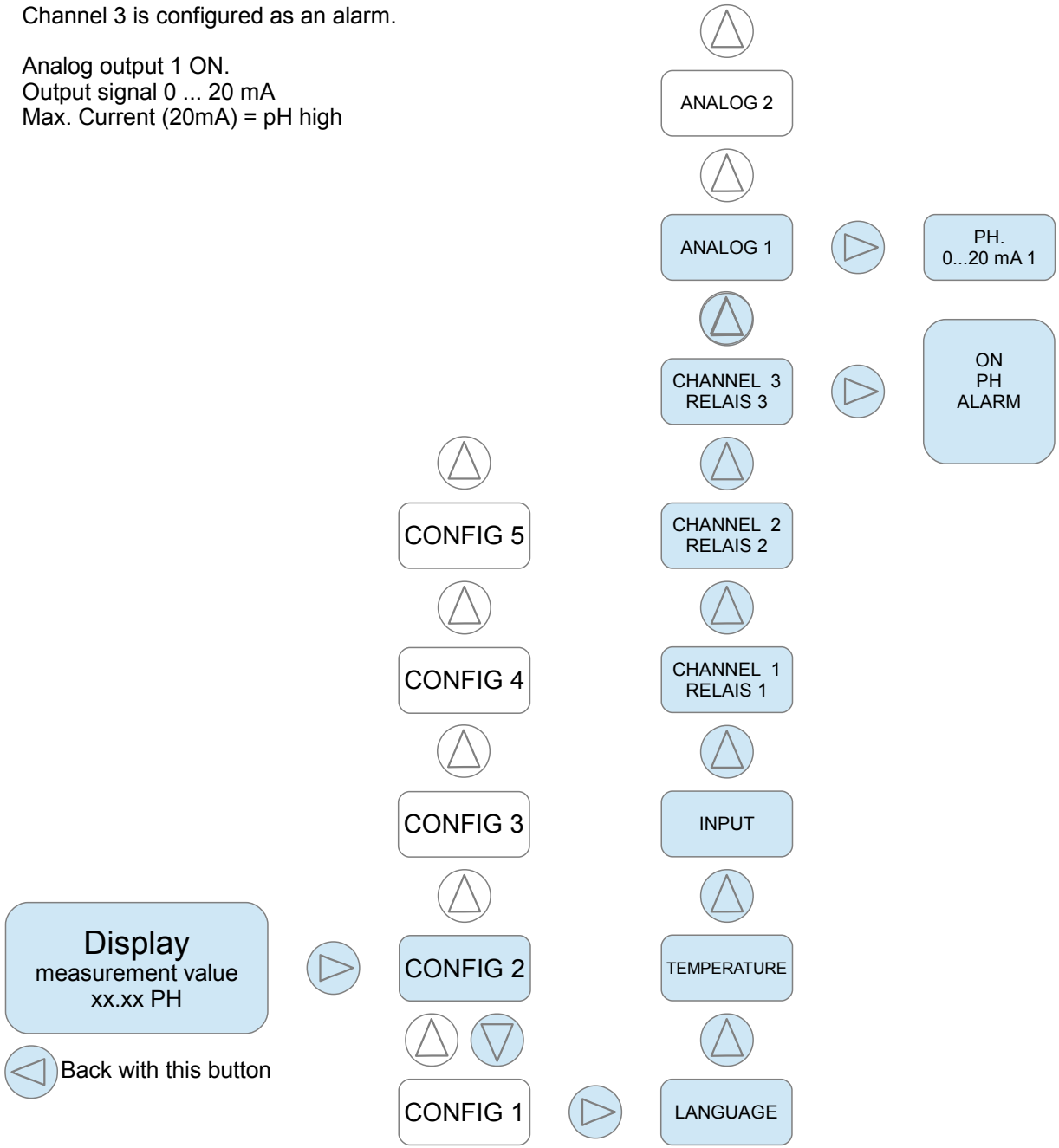
Pulse length = 170 ms



Configuration example for *pH - final check with analog output* Page 1

Channel 3 is configured as an alarm.

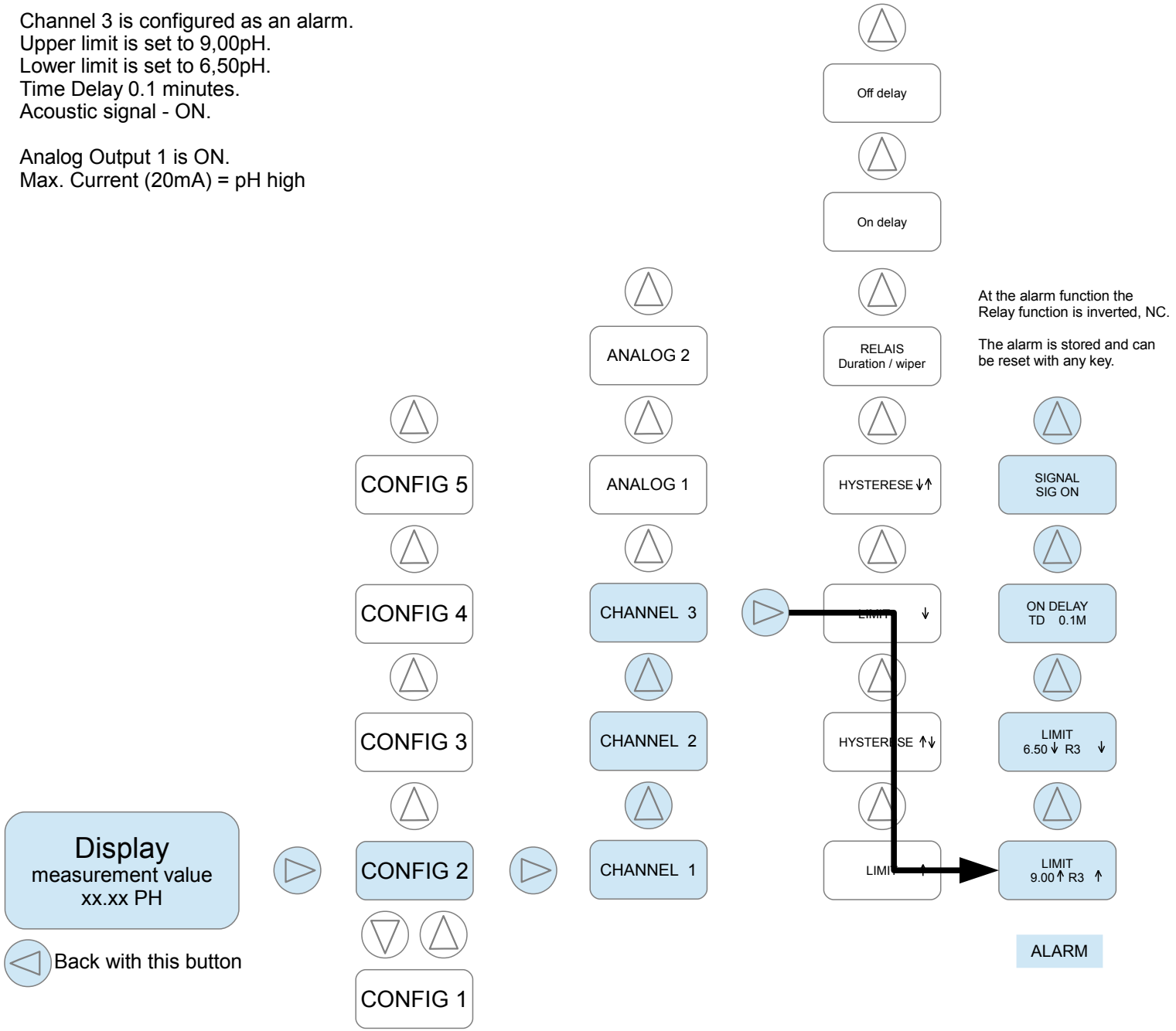
Analog output 1 ON.
Output signal 0 ... 20 mA
Max. Current (20mA) = pH high



Configuration example for *pH - final check with analog output* Page 2

Channel 3 is configured as an alarm.
Upper limit is set to 9,00pH.
Lower limit is set to 6,50pH.
Time Delay 0.1 minutes.
Acoustic signal - ON.

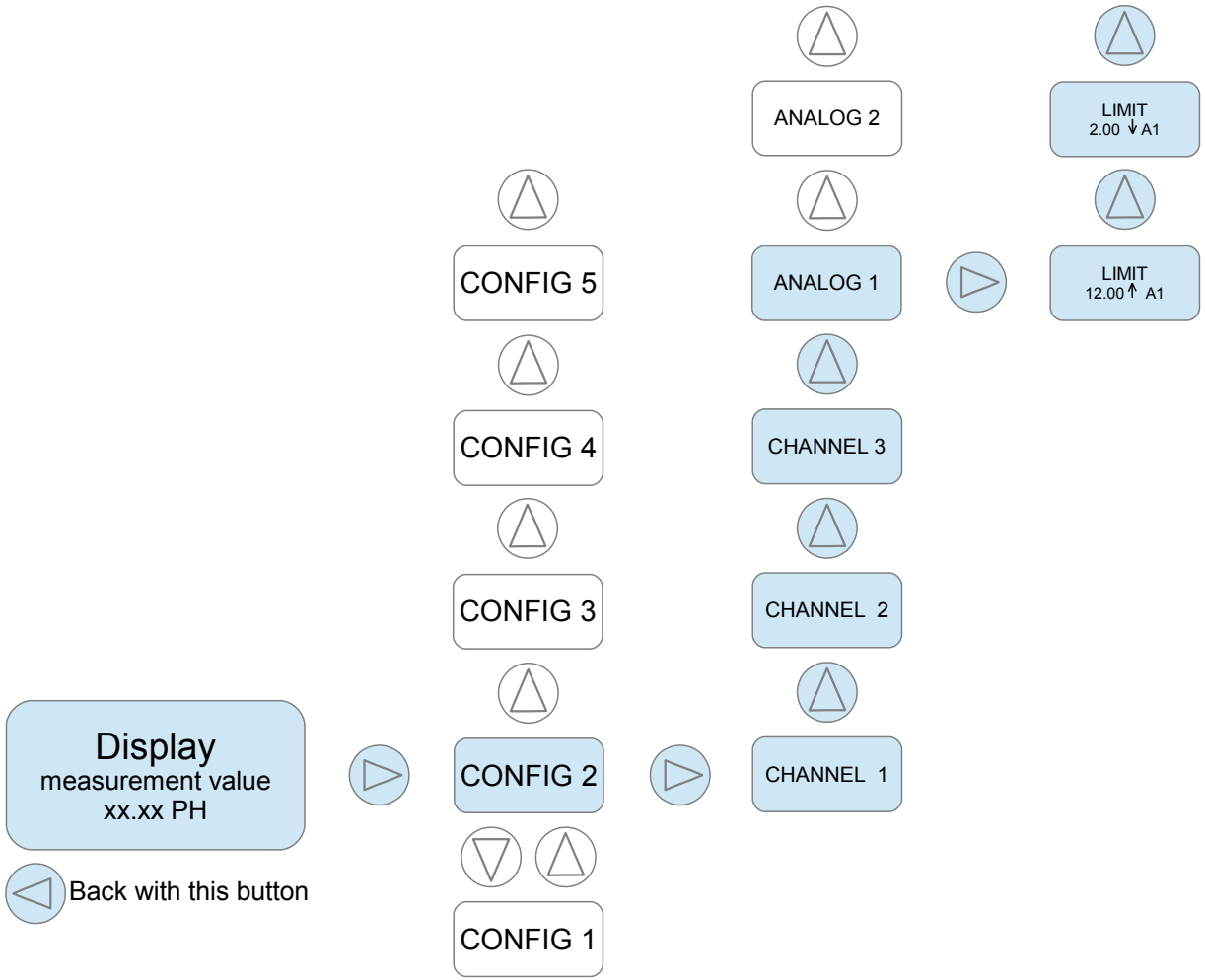
Analog Output 1 is ON.
Max. Current (20mA) = pH high



Configuration example for *pH - final check with analog output* Page 3

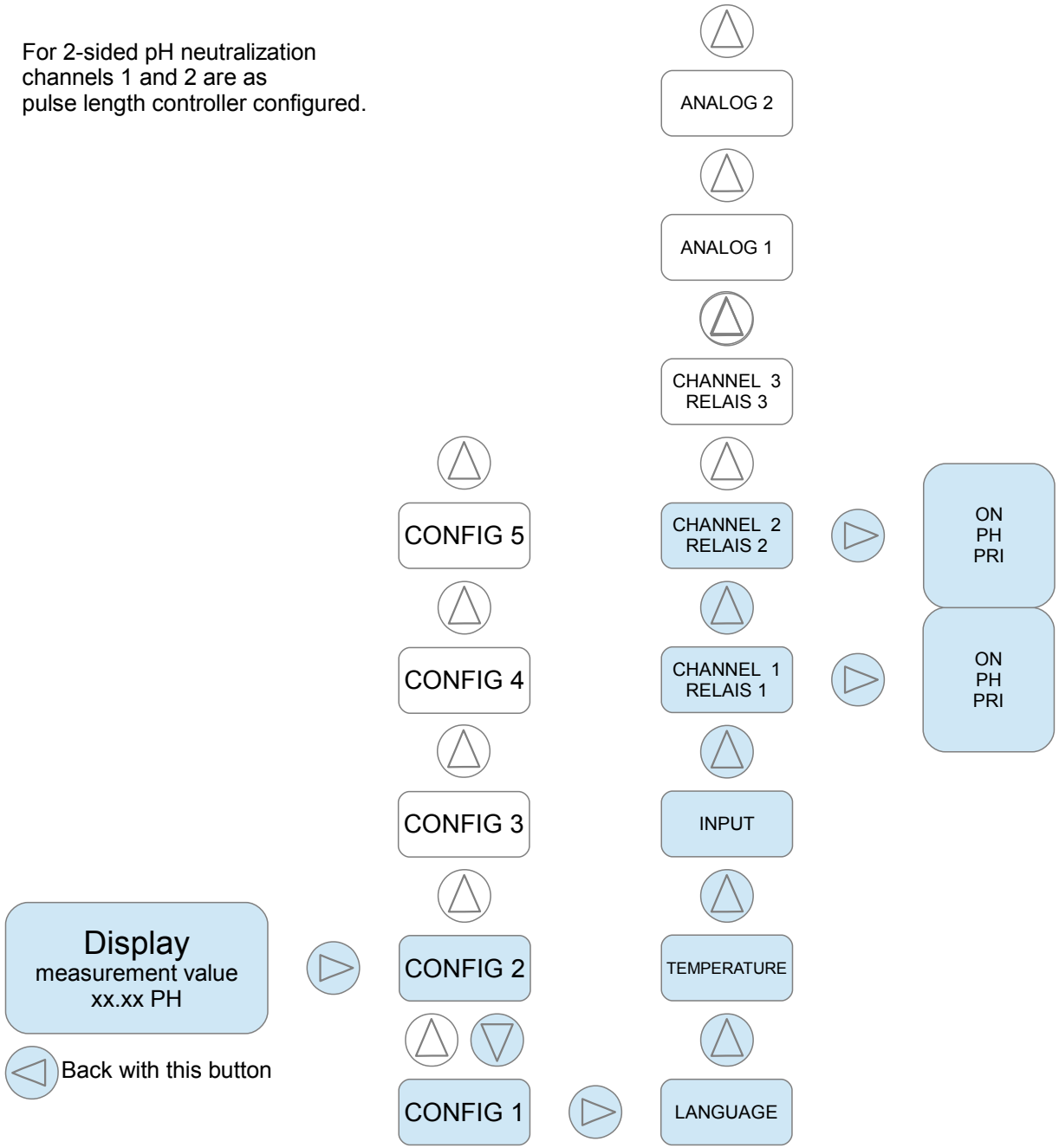
Channel 3 is configured as an alarm.
Upper limit is set to 9,00pH.
Lower limit is set to 6,50pH.
Time Delay 0.1 minutes.
Acoustic signal - ON.

Analog Output 1 is ON.
Output signal 0 ... 20 mA = 2 ... 12,00pH
Max. Current (20mA) = pH high



Configuration example *2 - sided pH – neutralization* Page 1

For 2-sided pH neutralization
channels 1 and 2 are as
pulse length controller configured.



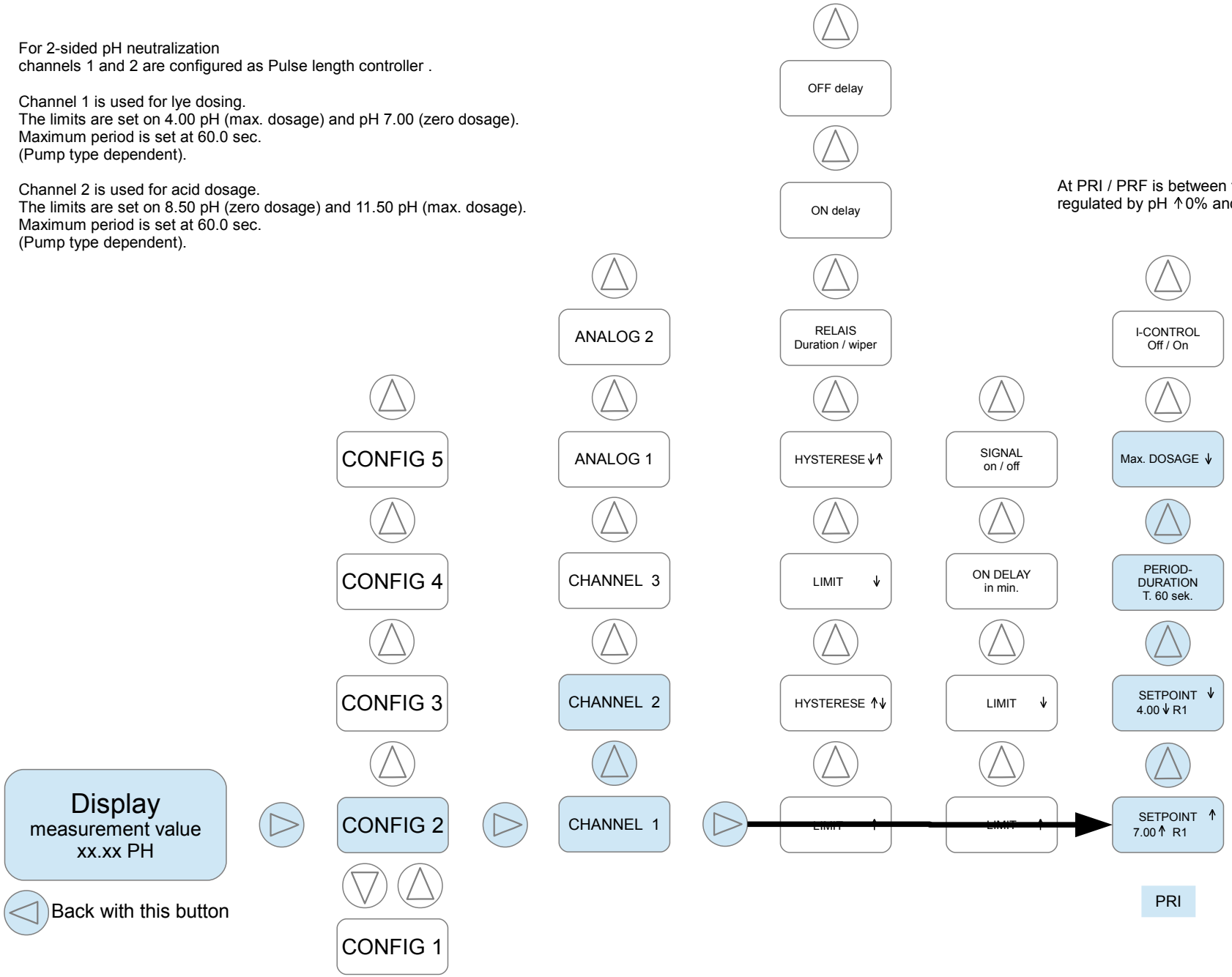
Configuration example 2 - *sided pH – neutralization* Page 2

For 2-sided pH neutralization
channels 1 and 2 are configured as Pulse length controller .

Channel 1 is used for lye dosing.
The limits are set on 4.00 pH (max. dosage) and pH 7.00 (zero dosage).
Maximum period is set at 60.0 sec.
(Pump type dependent).

Channel 2 is used for acid dosage.
The limits are set on 8.50 pH (zero dosage) and 11.50 pH (max. dosage).
Maximum period is set at 60.0 sec.
(Pump type dependent).

At PRI / PRF is between the limits
regulated by pH ↑0% and pH ↓100%.



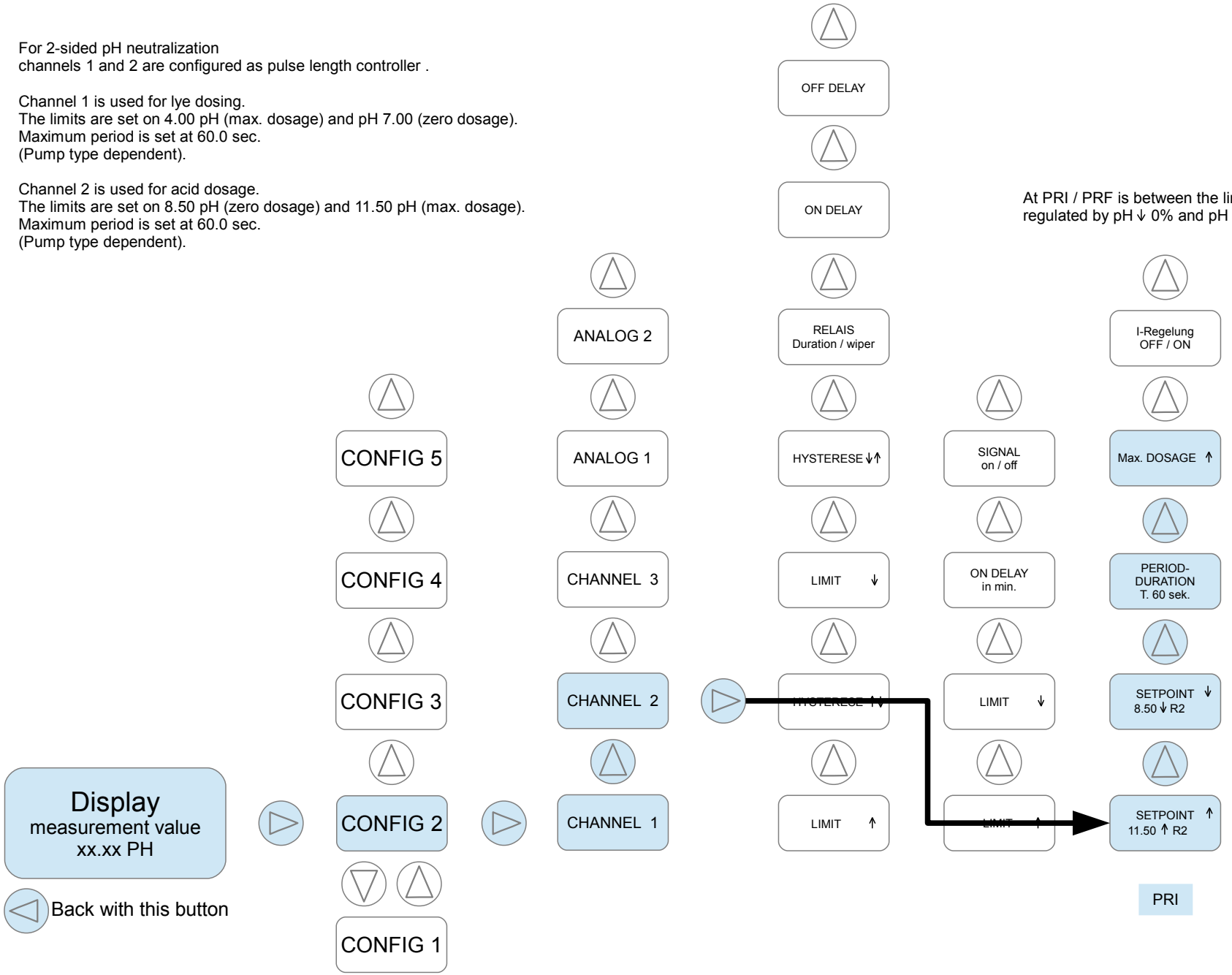
Configuration example 2 - *sided pH – neutralization* Page 3

For 2-sided pH neutralization
channels 1 and 2 are configured as pulse length controller .

Channel 1 is used for lye dosing.
The limits are set on 4.00 pH (max. dosage) and pH 7.00 (zero dosage).
Maximum period is set at 60.0 sec.
(Pump type dependent).

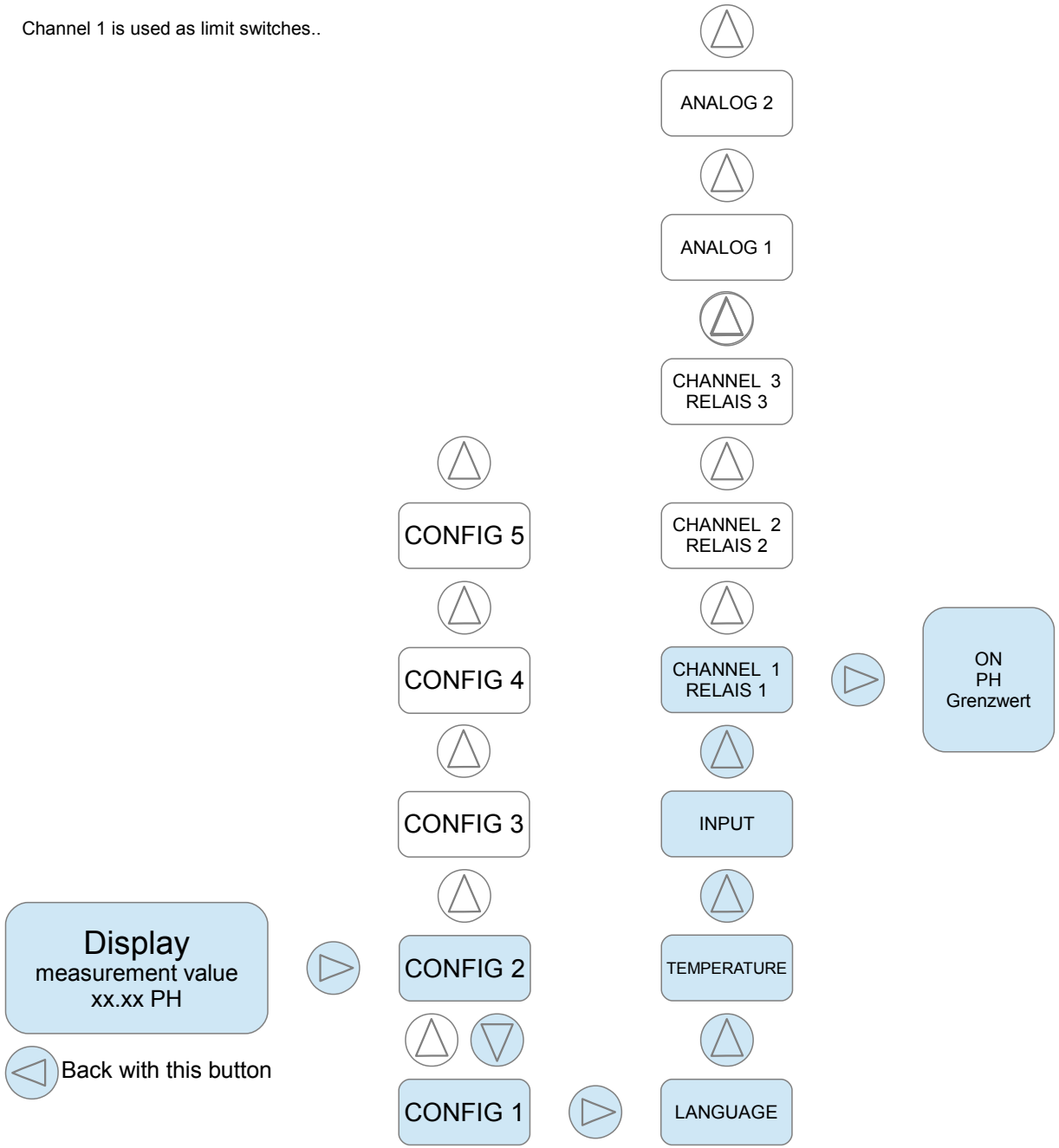
Channel 2 is used for acid dosage.
The limits are set on 8.50 pH (zero dosage) and 11.50 pH (max. dosage).
Maximum period is set at 60.0 sec.
(Pump type dependent).

At PRI / PRF is between the limits
regulated by pH ↓ 0% and pH ↑ 100%.



Configuration example of a *pH - limit (relay switches at exceeding)* Page1

Channel 1 is used as limit switches..

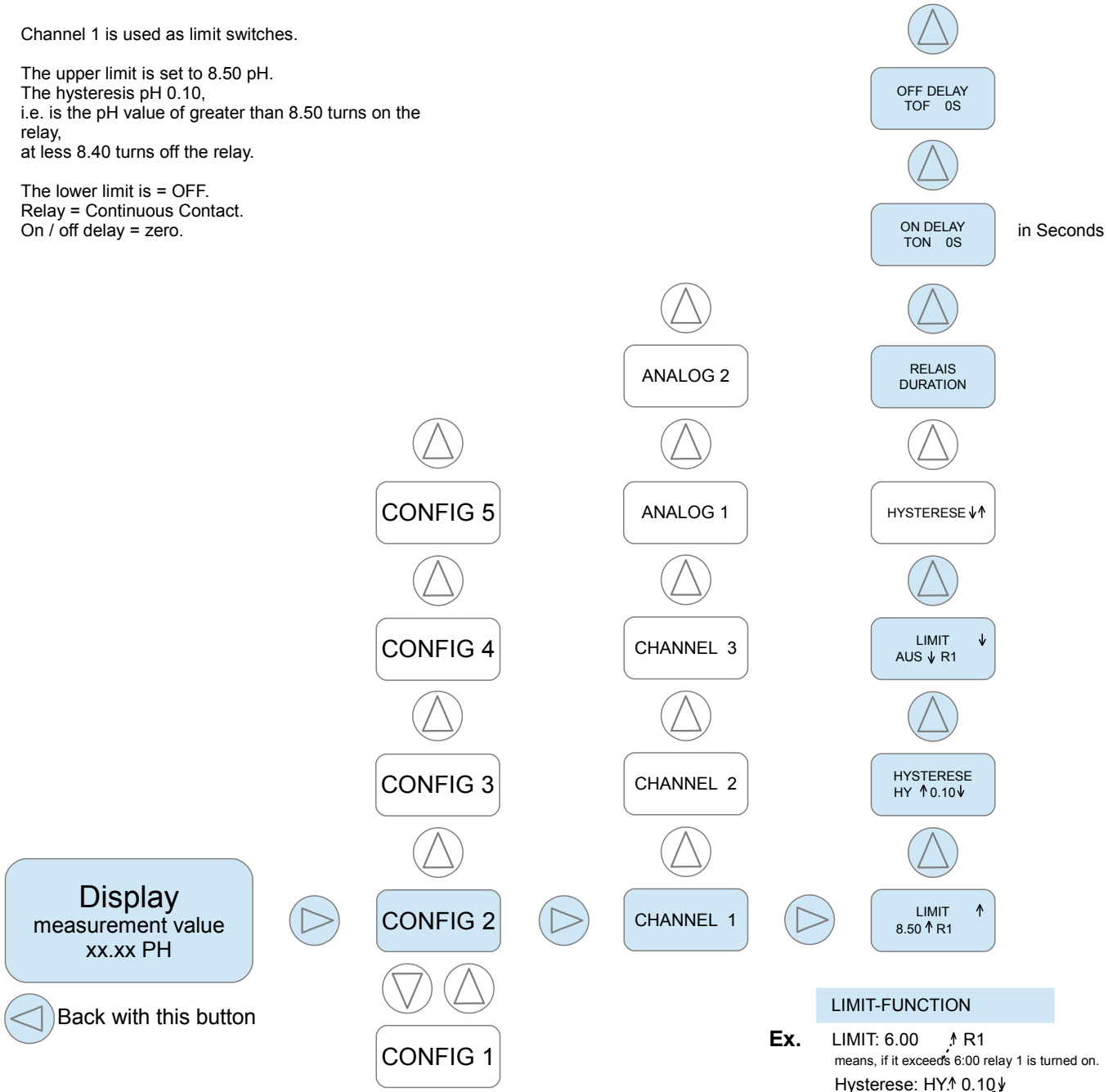


Configuration example of a *pH - limit (relay switches at exceeding)* Page2

Channel 1 is used as limit switches.

The upper limit is set to 8.50 pH.
The hysteresis pH 0.10,
i.e. is the pH value of greater than 8.50 turns on the relay,
at less 8.40 turns off the relay.

The lower limit is = OFF.
Relay = Continuous Contact.
On / off delay = zero.

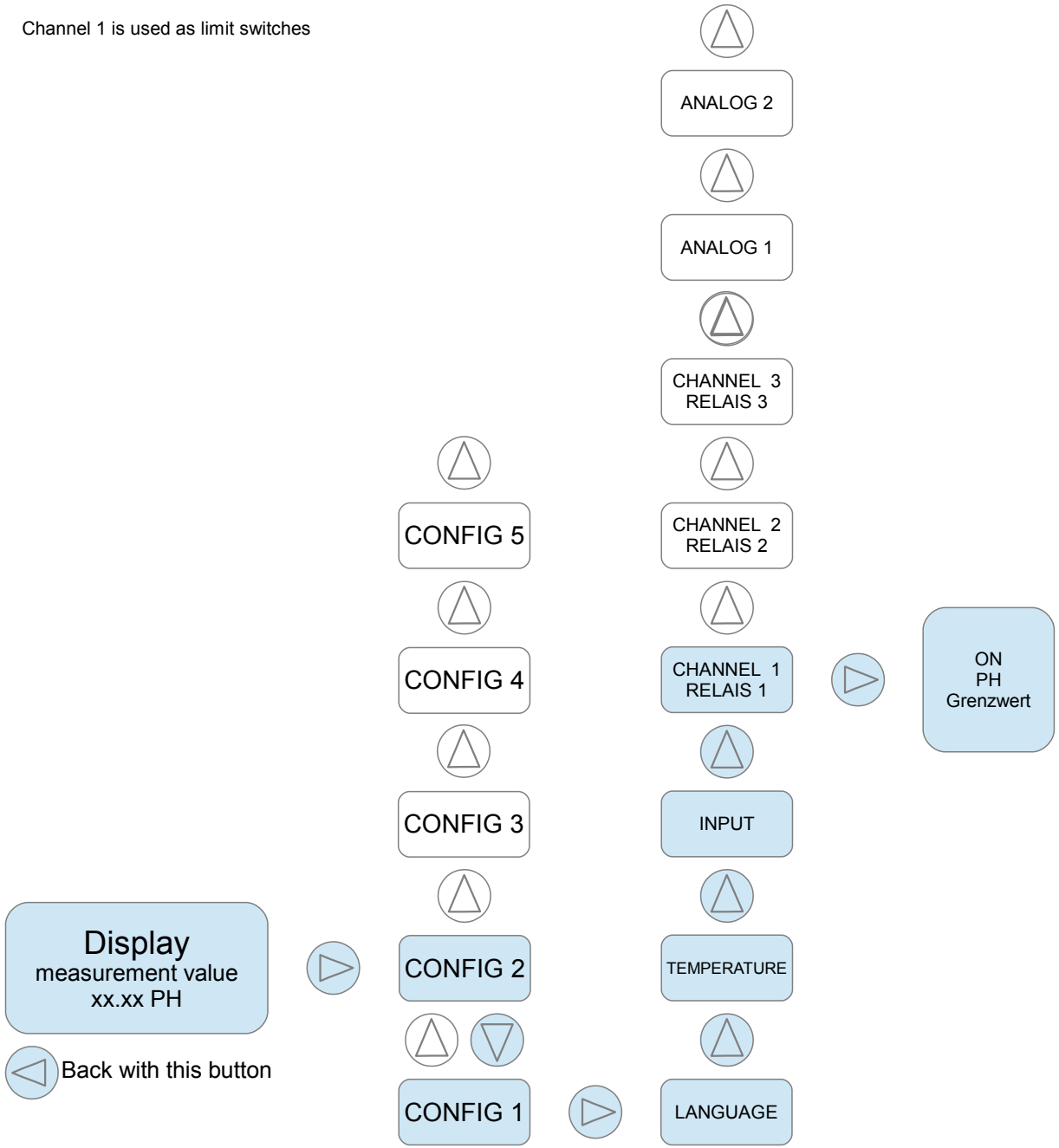


LIMIT-FUNCTION

Ex. LIMIT: 6.00 ↑ R1
means, if it exceeds 6:00 relay 1 is turned on.
Hysterese: HY↑ 0.10↓
means when falling under 5.90 Relay 1 is switched off again.

Configuration example of a *pH - limit (relay switches at underrun)* Page 1

Channel 1 is used as limit switches

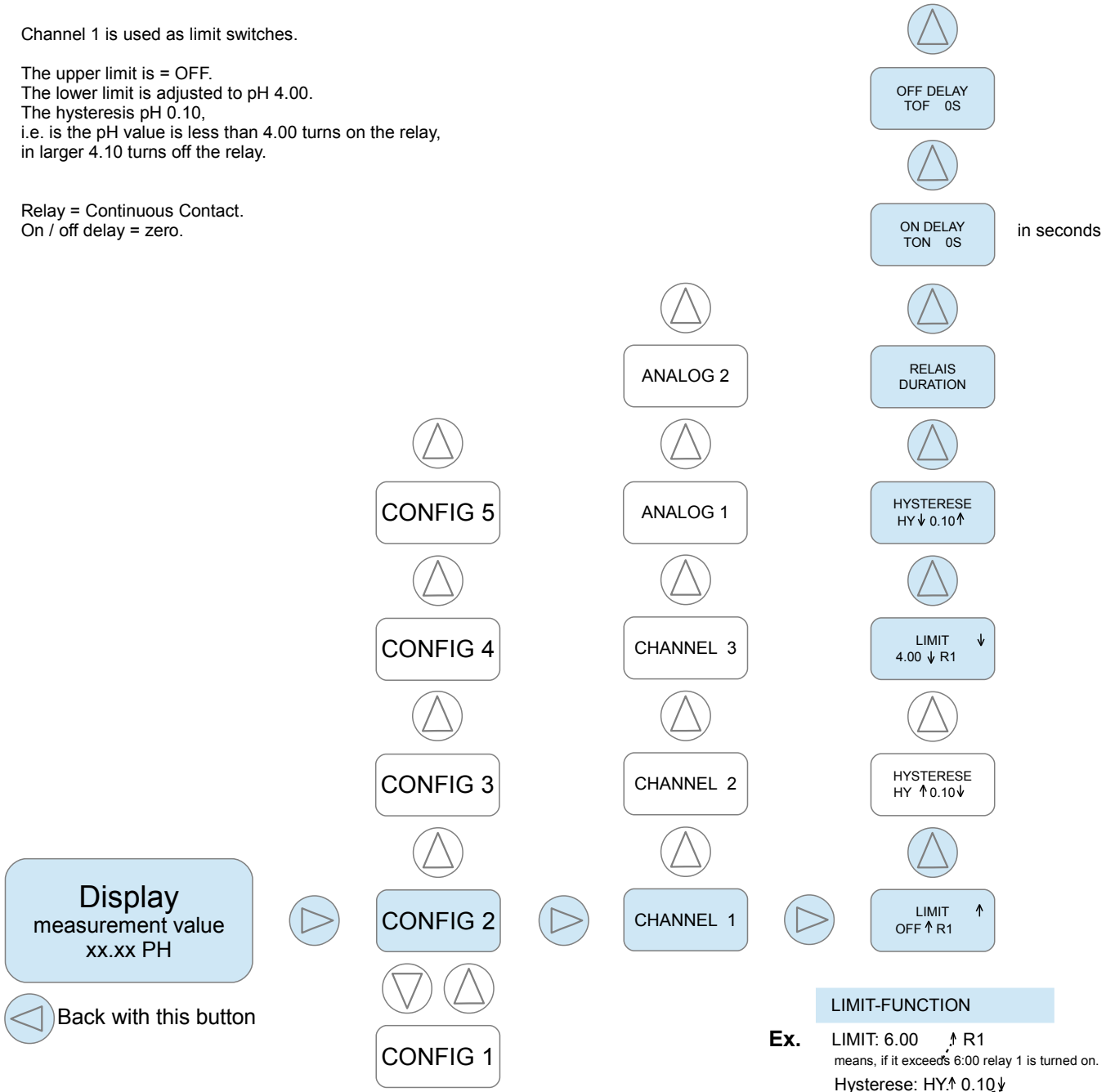


Configuration example of a *pH - limit (relay switches at underrun)* Page 2

Channel 1 is used as limit switches.

The upper limit is = OFF.
The lower limit is adjusted to pH 4.00.
The hysteresis pH 0.10,
i.e. is the pH value is less than 4.00 turns on the relay,
in larger 4.10 turns off the relay.

Relay = Continuous Contact.
On / off delay = zero.



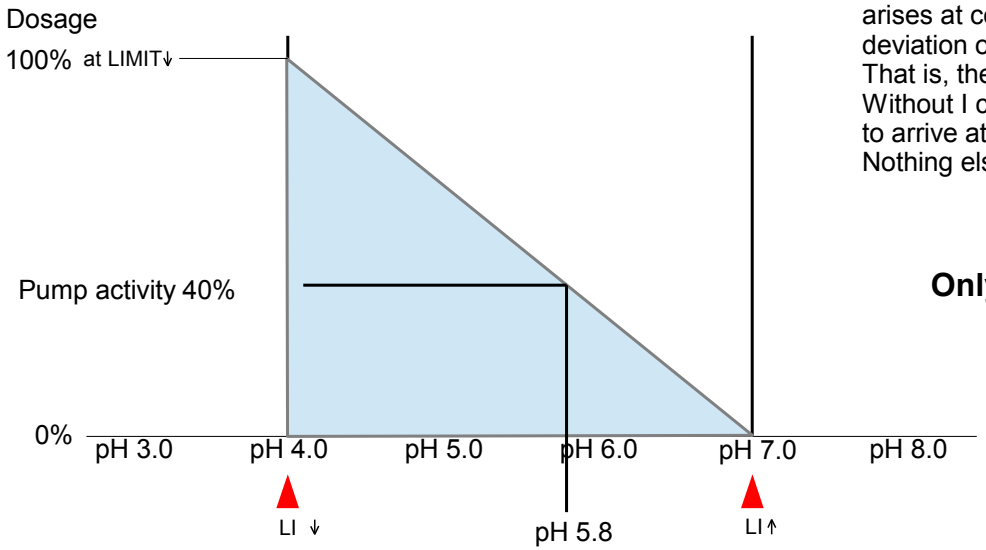
LIMIT-FUNCTION

Ex. LIMIT: 6.00 ↑ R1
means, if it exceeds 6:00 relay 1 is turned on.
Hysterese: HY.↑ 0.10↓
means when falling under 5.90 Relay 1 is switched off again.

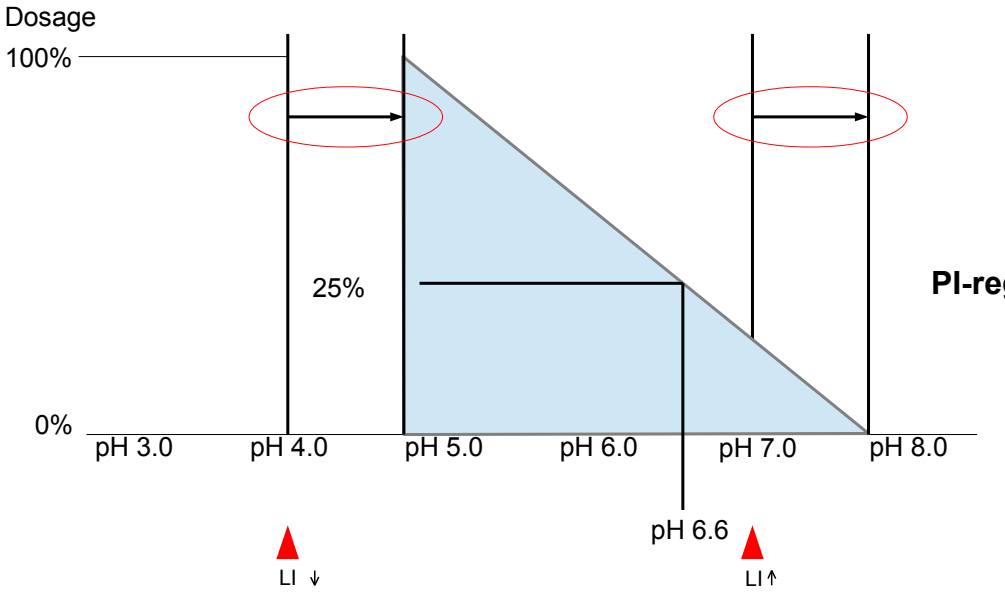
Function Description PI control

Example pH

With a throughput neutralization which is intended to regulate the pH 7.0,
arises at constant throughput with a pure P control a
deviation of 1.2 pH, due to the flow rate and pump capacity.
That is, the lye dosing levels off at 40%, the pH value displayed on 5.8.
Without I component is now takes the limits for GW ↑ and GW ↓ move to
to arrive at a dosing performance of about 40% at pH 7.0.
Nothing else makes the I component. He moves the dosing limits of 0 and 100%.

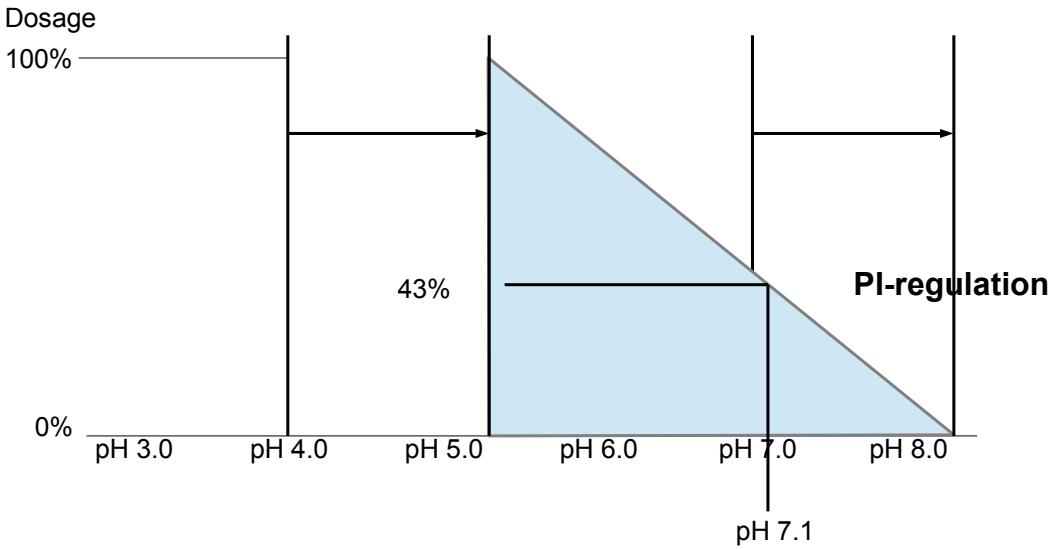


Only P-regulation



PI-regulation

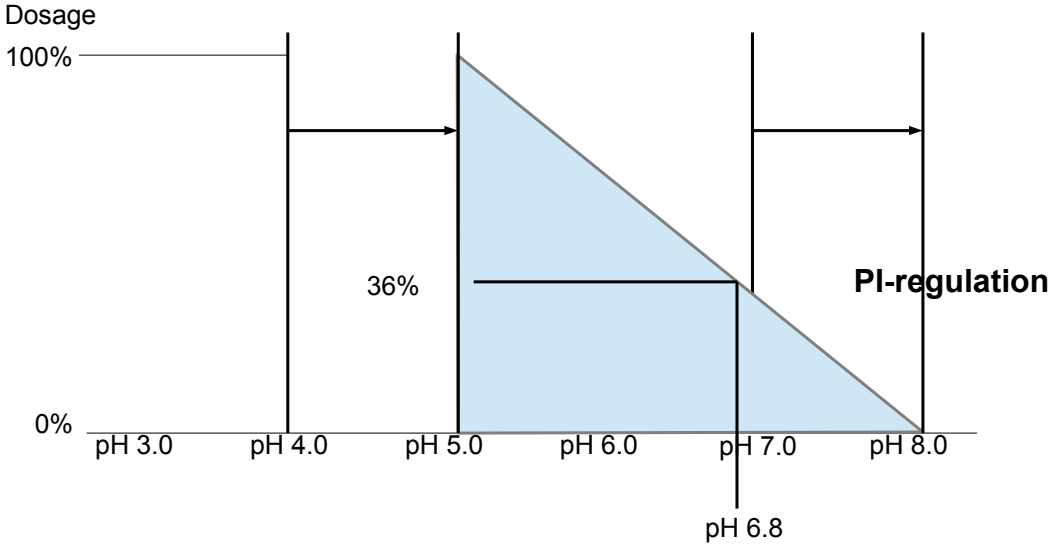
Through the I-component is the control on the right track.
But not yet arrived.
In this case, a constant offset to the dosing limits
GW ↑ and GW ↓ added.



Oops, something added too much. offset -

The speed of the reaction time can be preselected in 1% / 1 ... 99 sec.

If a constant acid supply is there,
then you can go on slowly.
Thus, you only have a small overshoot.
But when a very different inflow of
flow rate and pH-value is present,
you should respond quickly. That the reaction time must be fast.
In return, however, one takes thus a bigger
Overshoot in purchasing.



And now turn back. offset +