



Monitoring and Control System of pH / Chlorine in Swimming Pool PNL NOVA Pool pH/RX

TECHNICAL MANUAL

(rev.1.0 / 07-2022)



How to ship the system

To send back the system for repairing or calibration purposes, proceed as follows:

- Fill the module “REPAIR REQUEST AND DECONTAMINATION DECLARATION” and include it in the transport documentation.
- Clean the equipment properly, to eliminate any hazardous residuals.

The manufacturer can modify the instrument or the technical manual without advanced notice.

Warranty

All our products are warranted for a period of 12 months from the delivery date. Warranty is not valid if all instructions of installation, maintenance and use, are not strictly followed by the user. Local regulations and applicable standards have also to be followed.

In particular, the warranty will be recognized only if the following conditions are fulfilled:

- The installation, wiring, adjustment, maintenance and repairs performed only by qualified personnel
- The dosing pump was used according to instructions provided in this manual
- Only original spare parts have been used for repairs

HEALTH AND SAFETY



The system must be operated **ONLY** by authorized and trained technical personnel.

All instructions and prescriptions in the technical manual must be strictly followed.

Failure to follow these instructions can result in serious damages to the equipment and, in extreme cases, to people.

Warnings



This manual is dedicated to the technical personnel responsible of the installation, management and maintenance of the plants. The manufacturer assumes no responsibility for damages or malfunctions occurring after intervention by non-authorized personnel, or not compliant with the prescribed instructions.



All maintenance or repair must be performed with the system isolated both electrically and hydraulically. Before performing any operation on the pump, unplug the pump and discharge the liquid from the pump head and tubes. **Never operate on working pump!**



During maintenance and repair of parts that normally become in contact with chemicals, always wear all prescribed personal protections (gloves, clothes, glasses, etc.). Any intervention must be performed **ONLY** by qualified personnel and using original spare parts.



Dispose of waste material and consumables accordingly with local regulations.

Intended Use

The system can only be used after correct and proper installation and start-up, accordingly with the technical data and specifications listed in this instruction manual.

Observe the general restrictions on the viscosity ranges and chemical resistance of the materials in contact with the dosed product.

The system must only be used for liquid dosing.

All other uses are prohibited and any possible modifications.

The pumps are not suitable for dosing gaseous or solid media.

The pump is not suitable for dosing combustible substances without appropriate protective measures, it is not designed for dosing explosive liquids and is not intended for use in hazardous area.

The pump is not intended for use outdoors without appropriate protective measures.

Safety



The pumps can start to dose as soon as it is powered. It is recommended to install an emergency switch in the power line or connect the pump to the emergency stop system of the installation.



Risk of electric shock! If the pump housing is damaged, immediately unplug the pump and power it again only after a proper repair by an authorized technician.



Attention to dosed chemicals! Before any operation on the pump, discharge the liquid from the pump head and pipes. Take all necessary personal protective measures (i.e. gloves and goggles), as indicated in the SDS of the chemical, which must be always available and updated.



Attention to splashes! To prevent any leakage of the dosing liquid while operating on the pump, for example during maintenance, before the intervention depressurize all hydraulic components of the system. It is advisable to install a discharge valve in the delivery line upstream of the pump, to prevent overpressure or explosion of hydraulic components due to a block on the injection line.



Install the pump in an easily accessible place and respect the prescribed maintenance schedule.

In Case of Emergency

In an emergency, unplug the pump or disconnect the power through the emergency stop switch, depending on the installation. In case of leakage of the dosed liquid, depressurize the hydraulic system and take the protective measures indicated in the SDS of the chemical.

Technical Service

The technical service is provided only by qualified technicians, trained and authorized by the manufacturer for installation, maintenance and repair of the pump.

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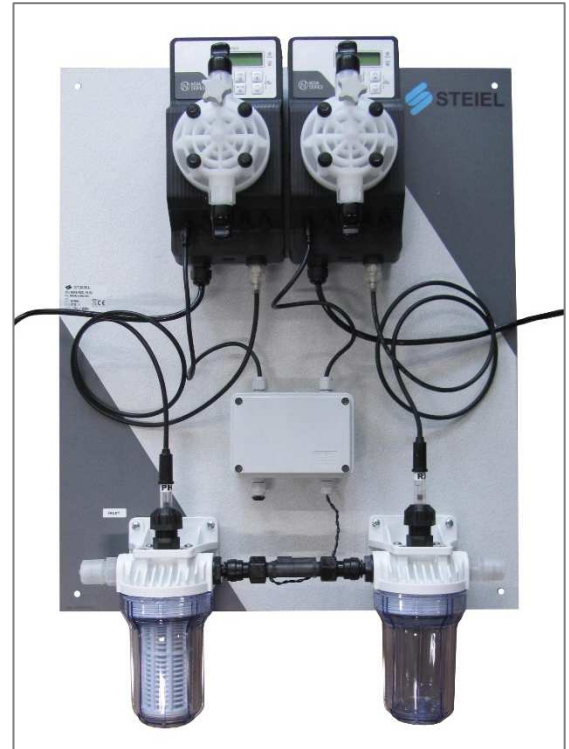
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Packing List

Ready-to-use system, assembled and wired on a panel, complete with:

- NOVA NSP162 C0512 PKT dosing pump with inbuilt meter configured for pH measurements
- NOVA NSP162 C0512 PKT dosing pump with inbuilt meter configured for ORP measurements
- pH electrode with plastic body and cable with BNC
- RX/Pt electrode with plastic body, platinum sensor, and cable with BNC connector
- Two SF17 downflow electrode-holders, with one 80 µm washable mesh cartridge
- “In-line” flow sensor mounted between the two electrode-holders

Supplied with calibration solutions (pH4, pH7, 220mV; 90 ml each), two accessory kits for solenoid pumps (foot filter, injection valve, hose for suction, delivery and purge lines), installation kit and instructions.



General Info and Principle of Operation

This panel has been designed to monitor and adjust the pH and chlorine level in swimming pool.

It is equipped with two NOVA NSP162 digital electromagnetic pumps with inbuilt instrument, which can work in pH, ORP or manual model; designed for wall mounting.

The pH value is measured directly with a proper electrode, while the chlorine concentration is determined indirectly via ORP measurements (see “Annex” for details).

Main features of the dosing pumps:

- Bilingual (Italian / English) interface
- Backlit LCD with customizable second row info
- Configuration menu protected by three-level password
- Counters of injected litres and diaphragm dosing strokes
- Configuration and calibration data saving in non volatile memory for at least 10 years
- **“Operation Mode” auto-setting function** for quick configuration of the pump
- **“Reset” function** to restore factory settings
- **“Service” Menu** reserved to authorized technicians and used for specific maintenances
- **Polyfunctional connector** for external consent / sample water flow
- Input for level switch
- Internal system for **overheating control / safety**
- **Anti-leakage system** towards the magnet
- Housing with **V-0 flame classification**



Technical Data

Panel Dimensions	500 x 600 mm
Panel Weight	approx. 12 kg
Hydraulic Connections	water inlet / outlet on standard connections for hose 6x8 mm
Suction Height	max 1.5 m
Viscosity of Dosed Product	max 200 mPas
Environment	storage temperature: -20 ... +60 °C working temperature: -10 ... +45 °C (not frozen liquids) RH max: 92% no condensing

DOSING PUMPS

Power Supply	standard: 230 V~, 50/60 Hz, cable w/ Schuko plug (other types available)
Display	dual row (x 12 characters) alphanumeric LCD, with backlight
Standard Materials	PP housing reinforced with glass fibre; PVDF head (even with self-bleeding valve); high quality EPDM membrane with fabric reinforcement, steel core and PTFE coating on the side in contact with the fluid; PTFE (FPM, EPDM) seals; ceramic ball valve (PTFE on request)
Protection Rate	IP65
Measurement Input	available on BNC connector, for pH or ORP electrode; input impedance >10 ¹² Ohm pH range: 0.00 ... 14.00 pH resolution 0.01 pH ; precision ±0.02 pH ORP range: 0 ... 1000 mV resolution 1 mV ; precision ±2 mV
LEV Input	available on M8 plug; input from level sensor, accept voltage-free contact
CONTROL Input	an external consent signal from the “in-line” flow sensor is wired at this input

Hydraulic Characteristics for 230 V version

Size	Flow Rate (l/h)	Pressure max (bar)	Injection Volume (ml)	Hose ID x OD
C0512	5.58	12	0.52	4 x 6 mm
	6.4	8	0.59	
	7.9	4	0.73	
	15.8	0.5	1.47	

Note: These data refer to standard heads, dosage of no viscous liquids, temperature 25°C, working frequency 180 strokes / minute, power supply 230 V~.

Note: In case of pumps powered at 115 V~, the performances may slightly differ from the data listed in the below tables and diagrams.



Warning! Failure to follow instructions can cause damage to the equipment and, in extreme cases, to people.

Warning! When working on pumps wear the adequate systems of personal protection (gloves, apron, goggles).

- Install the system **away from sources of heat, humidity and chemical fumes**. Also prevent that the pump is exposed to direct sunlight to avoid overheating. The minimum temperature shall be such as to ensure the solution to be dosed remains in a fluid state.
- If the pump is placed above the tank and the reagent fumes could be especially aggressive, check the tank seals.
- It is recommended to install the pump above the level of the liquid to be dosed, to a maximum height of 1.5 meters from the bottom of the tank. If pumps and / or injection valves are installed below the level of the liquid, it is advisable to equip the pumps with a multifunctional valve.
- The delivery connection is always on top of the dosing head and the hose connected goes to the system to be treated (use the white semi-rigid PE hose). The suction connection instead is always positioned in the lower part of the head (use for the suction line the soft transparent PVC Crystal tube) and insert the foot filter in the bottom of the container of liquid to be dosed. The pump head is also equipped with a manual vent valve, to which is connected a soft transparent PVC Crystal tube, for the return to the tank.

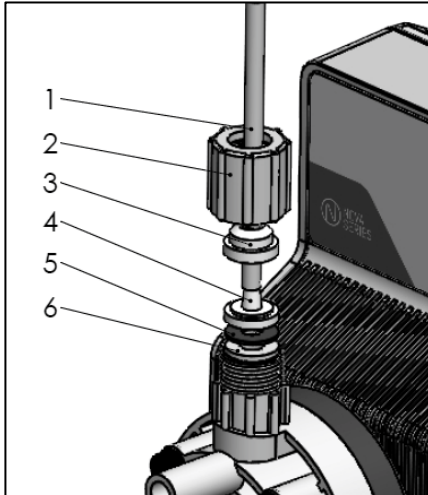
Note: If the product to be dosed is concentrated sulfuric acid, previously remove any water from the pump head and use a polyethylene suction hose.

- To avoid damage of the hydraulic connections, all operations to tighten the pipe on the dosing pump must be performed by hand, without using any tool.
- If the pump does not switch on even if powered, check the fuse. The fuse replacement must be performed only by a qualified technician and using a fuse of the same size and dimension.
- Exchanging phase and neutral connections does not affect the proper functioning of the pump, but the internal protection fuse will be connected to the neutral instead of the phase.
- The power supply grounding (yellow/green wire) must be connected to the grounding of the electrical system, in accordance with applicable requirements.
- Do not power the system in parallel with high inductive loads (e.g. circulation pumps), because at shutdown the inductive load causes an overvoltage which damages the power circuit and the power supply of the pumps.
- It is advisable to keep the **system always ON**, in order to avoid polarization delays of the sensor and, therefore, adjustment errors. Pump operations are controlled through the CONTROL input (dosage enabling) connected to the flow sensor assembled between the two probe-holders.



Hydraulic Connections

Suction and Delivery Lines



1. Hose
2. Threaded ring
3. Locking ring
4. Pipe-holder nozzle
5. Gasket
6. Valve

- Cut the hose to be connected to the pump (PVC Crystal for suction line or PE for delivery line).
- Insert the threaded ring (2) and the locking ring (3) on the hose.
- Attach the tube to the nozzle (4) pushing it up to the stop.
- Put the hose with the nozzle on the valve (6) and tighten the threaded ring while pushing the tube. Check that the gasket (5) is correctly located.
- Tighten the threaded ring.

Notes:

- Gaskets (5) are supplied of different materials: FPM (black, with green mark on the edge), EPDM (black) and PTFE (white). Choose the material most suitable to your application. It is advisable to favour the FPM and EPDM gaskets for their greater elasticity, and use PTFE gaskets only in case of chemical compatibility / resistance problems.
- It is recommended not to reuse the PTFE gaskets, because they deform permanently when compressed and therefore cannot ensure the sealing.
- Check that the delivery hose is correctly installed, verifying that it is not damaged by rubbing against rigid bodies.
- Avoid unnecessary bends and hose choking on both suction and delivery lines.

Bleeding (or Vent) Line

- Use the 4x6 PVC Crystal hose. Fix the return hose on the purge valve of the dosing head.
- Put the free end of the return pipe into the tank of product to be dosed.
- Cut the pipe so that it cannot dive in the feed chemical.



Wiring Instructions

The system is supplied prewired at the factory and normally the customer has only to connect the measurement sensors to the respective BNC connectors of the pumps.

Warning! To make a connection on the M8 plug, remove the protective cap and insert the female connector (cable) aligning it correctly with the pins of the male connector (pump). Then slowly screw the threaded ring by hand to secure the cable to the pump.

POWER: Power Cable

This cable (1.5 m long) has to be connected to the mains, in compliance with the relevant regulations. In the standard pump version, the cable is equipped with Schuko plug.

Make sure that there are suitable electrical outlets positioned at the right distance for connecting the pumps.

LEV: Input for Level Control

The pump comes set up for stopping dosage in case of low liquid level in the tank. The level control is carried out with a special float probe (optional).

When the product level in the tank falls below the probe, the pump stops and the “No Level !” warning message is displayed.

Note: The level switch is supplied with cable and prewired connector, and therefore you can simply plug it to the pump, without needing to pay attention to any connection polarity.

CONTROL: Input for External Commands

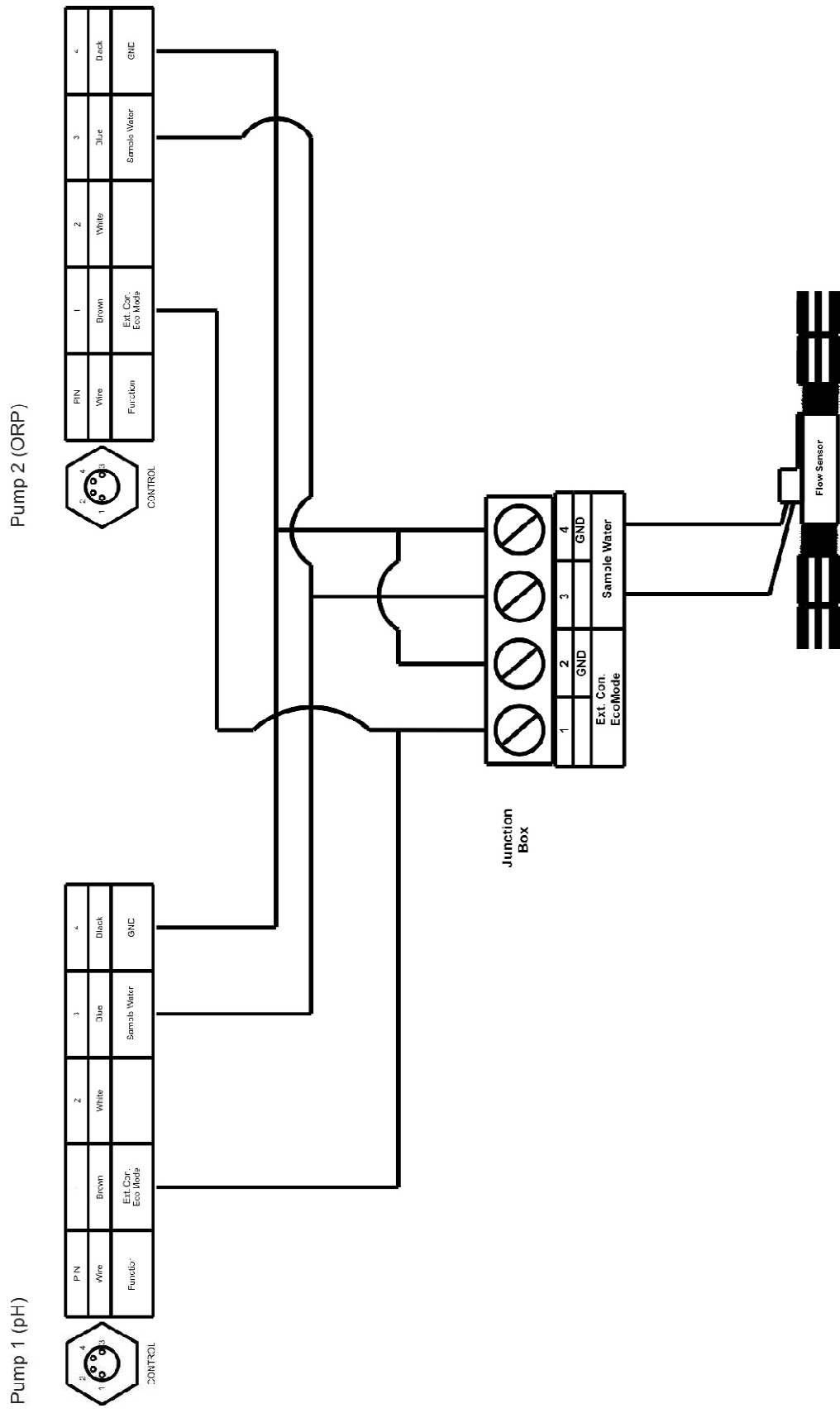
This input is used to stop the dosage according to an external signal and is wired to the sample water flow sensor (pins 3 and 4 of the M8 connector).

It is also possible to add an external consent or EcoMode, using the brown and black wires inside the junction box (see also indications on the next page).

	CONTROL Connector	Pin 1	Pin 2	Pin 3	Pin 4
	4-Wire Cable	Brown	White	Blue	Black
CONTROL input connected to	Sample Water (voltage-free contact)			V	V
	External consent or EcoMode	V			V

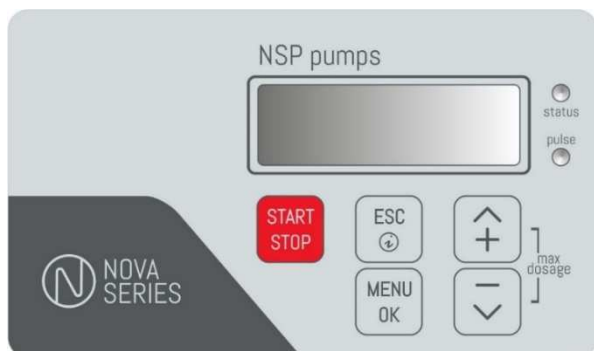


Connections of the Junction Box





Description of the Front Panel



Enables / disables the magnet without shutting down the pump.



Access a circular menu, the options of which can be scrolled with the arrow keys; within the menus, confirms the operation and / or the entered data.

Circular menu:

- **Language**
- **Operat. Mode** (only at the first access, to configure the working mode)
- **Calibration**
- **Adjustment**
- **Dosage**
- **Inputs**
- **General**
- **Counters**
- **Password**
- **Service**
- **Manual Test**



Press MENU/OK to confirm the access to the desired menu; if no choice is made, after one minute the pump resumes to normal operation / visualization.



Allows to exit calibration and configuration modes without saving the modifications.

From normal mode, activates the auxiliary visualization function (read only) on the second line of the display, with the following sequence:

- **Set Point**
- **Offset quality for electrode calibration**
- **Slope quality for electrode calibration**
- **Software version**
- **Hardware version**
- **Pump internal temperature**
- **Current working frequency**
- **Current working flow rate**
- **Litre-counter (for service / maintenance request)**
- **Injection flow control error (if enabled)**
- **Status of the output relay**
- **Injection volume**

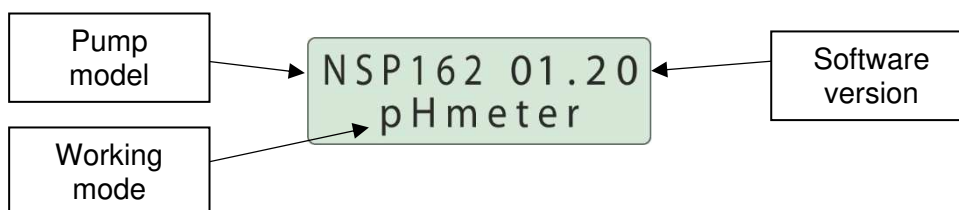
Note: One minute after last pressing of the ESC key, the pump returns to normal display.



	In calibration, configuration or manual mode, increases the displayed editable value. Scrolls the menus.
	In calibration, configuration or manual mode, decreases the displayed editable value. Scrolls the menus.
 	If pressed simultaneously, will force dosage at the maximum dosing frequency.
 	If the arrow keys and MENU/OK are pressed simultaneously, the pump doses at the maximum frequency the number of strokes set at "Counters – Priming Strokes" configuration step.
LED STATUS	Green light, flashing slowly → correct functioning Red light, flashing fast → alert of alarm / anomaly / stop Green light, series of 2 flashes → operation in progress (data editing, calibration or manual operation)
LED PULSE	Yellow light, flashes at each pulse of the magnet
Display	Dual row x 12 characters, alphanumeric LCD with backlight; displays messages in the set language 

Start-up

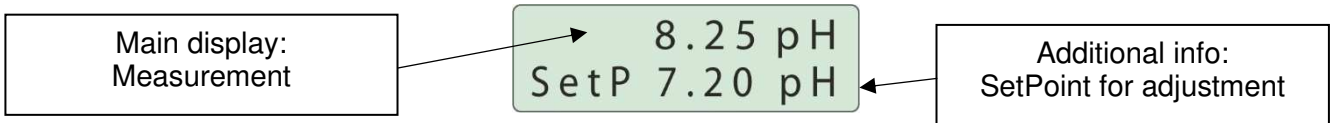
At start-up the pump model, software version and operation mode are displayed for a few seconds. Then the display shifts to the visualization configured for the normal operation mode.





Display Visualization

1. Display during normal operation of the pump:



2. Pressing the MENU/OK key will access the configuration menu. Here below you can see an example of the display sequence and use of the buttons to operate within the menus.

Press MENU/OK to access the configuration menu.	
	Menu Adjustment Use the arrow key to select the desired sub-menu, e.g. "Adjustment", then press MENU/OK to confirm.
	Adjustment Type Confirm the item to be edited, e.g. "Type", by pressing MENU/OK.
	Type Proport. The display shows the item with its current value; press MENU/OK to modify the value.
	Type ► Proport. The arrow cursor points the editable value; use the arrow keys to modify it.
	Press MENU/OK to confirm the new setting and return to previous level.
	Type ON-OFF Scroll the "Adjustment" sub-menu options.
	... or press ESC to return to the upper level.
	Press ESC again to quit configuration mode.



Configuration Menu, Main Level

8.40 pH SetP 7.20 pH MENU OK		From normal pump operation display, press the MENU/OK key to access the configuration menu. Use the arrow keys to scroll the available sub-menus.
	Menu Language	Sets the display language.
	↓	
	Menu Operat. Mode	Sets the pump operation mode; available only at first configuration.
	↓	
	Menu Calibration	Accesses to the sensor calibration menu (Offset – Slope)
	↓	
	Menu Adjustment	Defines the adjustment mode (SetPoint – dosed product)
	↓	
	Menu Dosage	Sets the dosing frequency and proportionality.
	↓	
	Menu Inputs	Defines the working modes of inputs (level, pause, flow, etc.).
	↓	
	Menu General	Includes all parameters related to the general settings (e.g. info displayed on the second line, reset, etc.).
	↓	
	Menu Counters	Sets or resets all counters (dosed litres, priming pulses, etc.).
	↓	
	Menu Password	Allows to enter the passwords for the three configuration levels: User, Master, Calibration.
	↓	
	Menu Service	This menu is password-protected and reserved to the authorized technical service, for specific maintenances.
	↓	
	Menu Manual Test	Allows to force dosage at fixed frequency, independently from the pump status.
	↓	

Menu Language		Confirming the “Language” option with the MENU/OK key will access a sub-menu which allows to set the display language.
MENU OK		
↑ + ↓ −	Language ITA	The available language are two, in the following combinations: Italian-English (standard), Spanish-English, French-English.
	Language ENG	



Menu Operat. Mode			This function is available only at the first configuration of the pump (or after a reset) and allows to load the factory values for the parameters related to the selected working mode. Scroll the available options and confirm the desired one with the MENU/OK key.
 	Operat. Mode pH-meter		
	Operat. Mode ORPmeter		The pumps measures the ORP value (mV) and adjusts the dosage of chlorine (oxidant) or de-chlorinating product (reductant).
	Operat. Mode Manual		The pump (if enabled) works at the constant rate set in parameter "Manual Freq." of the "Dosage" menu.



Warning! After an automatic set of the working mode, the flow rate and maintenance volume values will most probably not coincide with your configuration and, therefore, need to be reconfigured manually and / or calibrations have to be performed. Any special option of the pump is not considered in this function and has to be set again manually.

Menu Adjustment			This menu allows to set all parameters related to the adjustment controlled by the measurement (pH or ORP). More details are available in the specific sections.
 	Adjustment Type		Proportional / ON-OFF
	Adjustment Dosed Product		pH : Acid or Alkali ORP : Chlorine or Cl Red.
	Adjustment SetPoint		Threshold value, when exceeded activates dosage.
	Adjustment Hysteresis		Proportional band in case of proportional dosage; Hysteresis in case of ON-OFF adjustment.
	Adjustment Max dosage		A max time is set (in h : minutes) beyond which the pump stops even if the setpoint has not been reached.
	Adjustment Reset Max Dos		Manual (recommended setting) – Automatic (to be used in case of fluctuations due to the plant; in this way, the pump can be resume operation automatically).

Max Dosage

This function controls the correct functioning of the pump, depending on measurement sensor and product dosage.

Each time a dosing (adjustment) cycle starts, the pump starts counting the dosing time till the SetPoint is reached. If this time exceeds the value set in the "Max Dosage" parameter, the pump stops and triggers an alarm status.

This function is used to prevent plant damages, due for example to a dirty or exhausted measurement sensor, pump disengagement, breakage of the injection hose, clogged injection valve, wrong dosed chemical product.



Menu Inputs 		Confirming the “Inputs” option with the MENU/OK key will access a sub-menu which allows to configure the working mode of the available inputs. Scroll the options and confirm the desired one with MENU/OK key.
 	Inputs LEV	Configuration of the working mode for the level probe input.
	Inputs Ext.Cons	Configuration of the working mode for the external consent input (NO / NC / NO EcoM / NC EcoM).
	Inputs SW	Configuration of the working mode for the Sample Water flow input.

LEV This input for level switch can be configured as NO / NC contact:
NO = Normally Open contact, when closes stops dosing operations
NC = Normally Closed contact, when opens stops dosing operations

If the status is active (dosage stopped), the “No Level !” warning message is displayed.

Ext.Cons. This input has two different functions:

Consent (if configured as NO / NC)

External consent which enables the pump dosing.
 CONTROL connector. Connect the brown and black wires of the supplied cable to a voltage-free contact, controlled by the plant controller, which stops the dosage in case a specific event occurs (e.g. signal from filter pump, tank level, filter backwash, etc.).
 Can be configured as NO (Normally Open) or NC (Normally Closed).

If the status is active, the “Ext. Cons. !” warning message is displayed.

Eco Mode (if configured as NO EcoM. / NC EcoM.)

External consent which activates the EcoMode working mode of the pump, i.e. changes the adjustment setpoint value from normal setting to “SetPoint Eco”.
 External consent which enables the pump dosing.
 CONTROL connector. Connect the brown and black wires of the supplied cable to a voltage-free contact, controlled by the plant controller, which changes the setpoint value in case a specific event occurs (e.g. chlorine reduction, hyperchlorination, keeping a lower pH level).
 Can be configured as NO (Normally Open) or NC (Normally Closed).

If the status is active, the “SetP. Eco” warning message is displayed.

The parameters related to its behaviour are:

Menu	Sub-menu	Parameter
Adjustment	SetPoint	Value used for normal adjustment
	SetPoint Eco	Value used for EcoMode adjustment

SW Available on the CONTROL connector.
 The **Sample Water** input enables the pump dosing and is connected to a contact-type sample water flow sensor.
To be configured as NC (Normally Closed) contact.

If the status is active, the “Sample Water!” warning message is displayed.



Menu General		The “General” sub-menu allows to configure the general settings of the pump. Press MENU/OK to access, then scroll the available options and press again the MENU/OK key to confirm the desired one.
		
 	General Info1 Line2	Standard info on the second line of the display.
	General Info2 Line2	Alternative info on the second line of the display.
	General DST Change	If the pump is equipped with an internal clock, the automatic summer / winter time change can be enabled.
	General Start Delay	Allows to set a delay time at start-up (min : sec), after which the pump starts dosing.
	General PwrOn Status	Sets the pump status after reboot.
	General Stop in Edit	Sets the pump status during configuration.
	General Setup Enable	If the “Operat.Mode” option is not listed in the main menu, this item allows to enable it.
	General Reset	Reset the pump and enable the “Operat.Mode” function.

Available settings:

Info1 Line2	Info2 Line2	DST Change	Start delay	PwrOn Status	Stop in Edit	Reset
Flow Rate	Flow Rate	No	00:02 ... 59:59	Remember	No	No
Frequency	Frequency	Yes		Start	Yes	Yes
Temper.	Temper.			Stop		
Clock	Clock					
Litre Counter	Excluded					



Menu Counters		The “Counters” sub-menu allows to set and / or reset all pump counters. Press MENU/OK to access, then scroll the available options and press again the MENU/OK key to confirm the desired one.
MENU OK		
↑ + ↓ -	Counters Litre Reset	Resets the counter of dosed litres.
	Counters Prim. Strokes	Allows to set the maximum number of strokes allowed in a self-priming attempt or in case of priming forced by pressing simultaneously the [+] [-] MENU/OK keys.
	Counters ServiceCount	Allows to set after how many injected litres the message of service request will be displayed.

Litre Reset

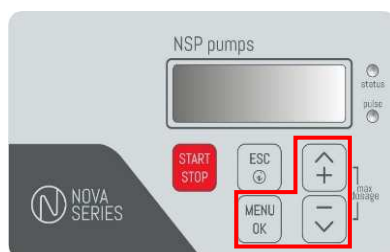
A hydraulically calibrated pump can count the litres of dosed product. This function is very useful for dosing statistics and to estimate the residual product in the suction tank.

Each time the tank is replaced or refilled, you must reset the litre-counter by accessing the “Counters” sub-menu and confirming this option.

Priming Strokes

This parameter is used to set the maximum number of allowed strokes in a self-priming attempt, after an alert of dosing lack generated by the Flow Control.

In case of forcing following the simultaneously pressing of [+] [-] OK keys, the pump doses at the maximum frequency for the maximum number of strokes set in this parameter.



Service Counter

The elements most subject to wear, such as the valves and the dosing diaphragm, require periodic maintenance (cleaning or replacement).

The recommended maintenance frequency depends on the application and can be defined with this parameter in terms of dosed litres. When the set limit is exceeded, a message of maintenance request is displayed.



Menu Password		This sub-menu allows to enter the protection passwords for the three configuration levels of the pump. Press MENU/OK to access, then scroll the available options and press again the MENU/OK key to confirm the desired one.		
MENU OK				
↑ ↓	Password Master PSW	MENU OK	Master PSW 000	Protects / enables all configuration parameters.
	Password User PSW	MENU OK	User PSW 000	Protects / enables only operation parameters (see below).
	Password Calib. PSW	MENU OK	Calib. PSW 000	Protects / enables the hydraulic calibration of the pump.



Warning! Do not forget the set password because it cannot be recovered, but only reset by the manufacturer / authorized technical service.

All passwords allow to see all parameters in read-only mode, even those not editable depending on the enabled access level.

- The **MASTER** PASSWORD enables to access all parameters.
- The **USER** PASSWORD enables to edit the following parameters:
 - DOSAGE Menu → Manual / Min / Max Frequency
Mult./Div. / Stroke Mem. / Keeping Time
 - GENERAL Menu → Auxiliary visualization (Info on Line 2)
 - COUNTERS Menu → Litre Reset / Priming Strokes
 - TIMER Menu → Clock Set
- The **CALIBRATION** PASSWORD enables to edit the following parameters:
 - DOSAGE Menu → Pump Calibration / Injection Volume
 - CALIBRATION Menu → Electrode Calibration (Offset and Slope)

Menu Service	Password-protected menu, only for technical personnel authorized to the pump maintenance.
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Menu Manual Test	This sub-menu allows to force manually the dosage. The reference working frequency is that set in the “Dosage / Manual Frequency” parameter.
MENU OK	
Manual test xxΠ xxΠ/m	Once the dosing is started with the START button, the pump displays the reference frequency and the counter of performed strokes. The working frequency can be modified with the arrow keys.

To suspend the Test dosage, press the START/STOP key.
To quit the Test mode, press ESC.

Calibration of the pH Sensor

Sensor calibration must be performed at first start-up and repeated periodically, depending on sensor performance drift and possible dirty / deposits.

Two calibration modes are available:

BUFFER SOLUTION (2 points) Recommended for accurate measurements	SELF TEST (1 point) Quick check of the electrode status
 Two-point calibration, with buffer solutions	 One-point calibration, via comparison with a reference instrument



Calibration procedure with buffer solutions, two points:

Needed material: distilled water, pH 7 buffer, pH 4 buffer.

Procedure:

- Remove sensor from the electrode-holder.
- Rinse it with distilled water and let it dry (do not use any paper or cloth).
- Immerse the sensor in pH7 solution and wait for stable reading.

Menu Calibration 		Starts a guided calibration sequence.
    	Calibration BufferSolut.	Select the "Buffer Solut." option to perform a 2-point procedure.
	Buffer OK -> Go	Confirm the selected procedure.
	→ Offset 7 Slope 4/9	Proceed with the first calibration point, pH7 buffer. Calibration of the sensor offset.
	Offset 7 → 7.01 pH	If the solution pH is different from the expected one, you can modify the calibration value.
	Waiting Stab. (6.98)	The pump waits for stable reading and displays on the second line the real reading (within brackets).
	Calibration Offs: Excell. Offs: 0.03	Then the real offset value is displayed, with a quality indication.
	Calibration BufferSolut.	Rinse the sensor with distilled water and immerse it in pH4 or pH9 solution.

↑ + ↓ −	Offset 7 ➔ Slope 4/9	Proceed with the second calibration point, pH4 buffer. Calibration of the sensor slope.
	Slope 4 / 9 ➔ 4.01 pH	If the solution pH is different from the expected one, you can modify the calibration value.
	WaitingStab. (4.10)	The pump waits for stable reading and displays on the second line the real reading (within brackets).
	Calibration Slope: Excell. Slope: 0.953	Then the real slope value is displayed, with a quality indication.
	Calibration BufferSolut.	Rinse the sensor with distilled water and install it back in the electrode-holder.



Self test calibration procedure, 1 point:

Needed material: reference analysis instrument, portable photometer or pH-meter.

Procedure:

- Leave the sensor in the electrode-holder.
- Take a water sample and measure the pH with the reference instrument.

Menu Calibration		Starts a guided calibration sequence.
MENU OK		
↑ + ↓ −	Calibration Self Test	Select the “Self Test” option to perform a single point procedure.
	Self Test OK -> Go	Confirm the selected procedure.
	Self Test ➔ 7.25 pH	If the solution pH is different from the expected one, you can modify the calibration value.
	WaitingStab. (7.12)	The pump waits for stable reading and displays on the second line the real reading (within brackets).
	Self Test Offs: Excell. Offs: 0.03	Then the real offset value is displayed, with a quality indication.
	Calibration Self Test	Quit the procedure pressing

Notes after sensor calibration



During normal operations of the pump you can read the Offset and Slope values of the last calibration using the “info” key.

Qualitative indications about the electrode status:

Excellent / Good	Discrete	Insufficient	Calibration failed
Electrode properly working.	Have a new spare electrode available.	Sensor cannot be calibrated. Check calibration conditions * and repeat the procedure. If the response does not improve, replace the electrode.	See note. *

* A calibration error can be due to the following causes:

- 1) Wrong or polluted buffer solution.
- 2) Dirty electrode; clean it properly.
- 3) During cleaning, the electrode was rubbed with paper or cloths and charged electrostatically; immerse it in pH4 buffer for approx. 20 minutes.
- 4) Too high or too low temperature; this pump is not thermo-compensated and therefore should be used with electrodes working at ambient temperature (10 ... 30 °C).
- 5) Air bubble in the sensitive bulb, due to the electrode wrong (horizontal or upside down) position for too long; place it vertically and wait for the air to go upwards.
- 6) The electrode bulb has been left drying; immerse it in pH4 buffer for 1 hour.
- 7) The electrode cable is damaged or oxidized; replace it.
- 8) The cable connector is moist or oxidized; dry and clean it.
- 9) The electrode is exhausted and has to be replaced with a new one.

Note: Buy your pH electrode shortly before the replacement time, avoiding long storage; store it in a fresh area, with the bulb always immersed in storage solution.

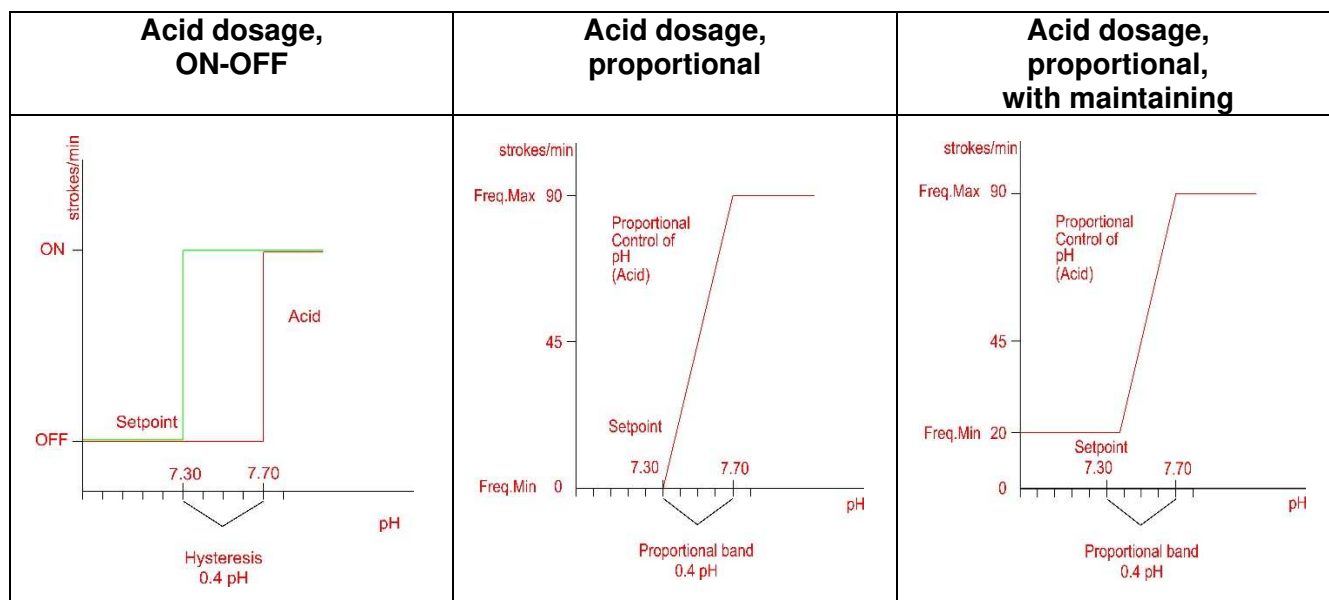
pH Control with ACID Dosage

The crucial parameters which control this working mode are:

Menu	Sub-menu	Parameter (example)
Operat. Mode	pH-meter	
Adjustment	Type	Proportional / ON-OFF
	Dosed Product	Acid
	SetPoint	(7.30)
	Proportional Band / Hysteresis	(0.40)
	Max Dosage *	(00:03) hh:mm (3 minutes)
Dosage	Max Frequency	(90) strokes per minute

* **Max dosage:** This functions controls the correct functioning of the pump. If the setpoint is not reached within the set time, the pump stops and triggers an alarm status.

This function allows to avoid dangerous dosages, for example in case of measurement sensor failure or breakage of the injection line.



ON-OFF Adjustment: quick adjustment, useful for systems that not require to keep the value near the SetPoint, but are affected by abrupt changes due to sudden fluctuations in the plant.

The parameters controlling the system behaviour are the hysteresis and pump working frequency.

PROPORTIONAL Adjustment: progressive adjustment, useful for systems that need to keep the value near the SetPoint, avoiding abrupt adjustment variations.

The parameters controlling the system behaviour are the proportional band and pump working frequency. The setting of these parameters is crucial to ensure a good adjustment of the system.

Any maintaining dosage (min frequency >0) is used only for special applications, which require a constant minimum correction (to always be used in case of external consent connected to a device determining the maintaining need).

Calibration of the ORP (redox) Sensor

Sensor calibration must be performed at first start-up and repeated periodically, depending on sensor performance drift and possible dirty / deposits.

Two calibration modes are available:

BUFFER SOLUTION (1 point) Recommended for accurate measurements	SELF TEST (1 point) Quick check of the electrode status
 One-point calibration, with standard calibration solution	 One-point calibration, via comparison with a reference instrument

For ORP measurements, only the sensor offset is calibrated.
The single point procedure is the same for the two modes, BUFFER and SELF TEST.



Calibration procedure with reference standard:

Needed material: distilled water, 220 mV standard solution.

Procedure:

- Remove sensor from the electrode-holder.
- Wash it with distilled water and let it dry, without rubbing it with paper or cloths.
- Immerse the sensor in the 220 mV solution and wait for stable reading.

Menu Calibration 		Starts a guided calibration sequence.
    	Calibration BufferSolut.	Select the “Buffer Solut.” option.
	BufferSolut. OK -> Go	Confirm the selected procedure.
	→ Offset	Proceed with the calibration of sensor offset.
	Offset → 220 mV	If the solution value differs from the expected one, you can modify the calibration value.
	WaitingStab. (266 mV)	The pump waits for stable reading and displays on the second line the real reading (within brackets).

Calibration Offs: Good Offs: 46	Then the real offset value is displayed, with a quality indication.
Calibration BufferSolut.	Rinse the sensor with distilled water and install it back in the electrode-holder.



Self test calibration procedure:

Needed material: reference analysis instrument (portable ORP-meter).

Procedure:

- Leave the sensor in the electrode-holder.
- Take a water sample and measure the ORP (mV) value with the reference instrument.

Menu Calibration	Starts a guided calibration sequence.
MENU OK	
Calibration Self Test	Select the “Self Test” option.
Self Test OK -> Go	Confirm the selected procedure.
Self test → 219 mV	If the solution value differs from the expected one, you can modify the calibration value.
WeitingStab. (265 mV)	The pump waits for stable reading and displays on the second line the real reading (within brackets).
Calibration Offs: Good Offs: 46	Then the real offset value is displayed, with a quality indication.
Calibration Self Test	Quit calibration procedure by pressing
	ESC

Notes after sensor calibration



During normal operations of the pump you can read the Offset value of the last calibration using the “info” key.

Qualitative indications about the electrode status:

Excellent / Good	Discrete	Insufficient	Calibration failed
Electrode properly working.	Have a new spare electrode available.	Sensor cannot be calibrated. Check calibration conditions * and repeat the procedure. If the response does not improve, replace the electrode.	See note. *

* A calibration error can be due to the following causes:

- 1) Wrong or polluted calibration solution.
- 2) Dirty electrode; clean it properly.
- 3) Air bubble in the sensitive bulb, due to the electrode wrong (horizontal or upside down) position for too long; place it vertically and wait for the air to go upwards.
- 4) The electrode has been left drying; immerse it in pH4 buffer for 1 hour.
- 5) The electrode cable is damaged or oxidized; replace it.
- 6) The cable connector is moist or oxidized; dry and clean it.
- 7) The electrode is exhausted and has to be replaced with a new one.

Note: Buy your ORP electrode shortly before the replacement time, avoiding long storage; store it in a fresh area, with the tip always immersed in storage solution.

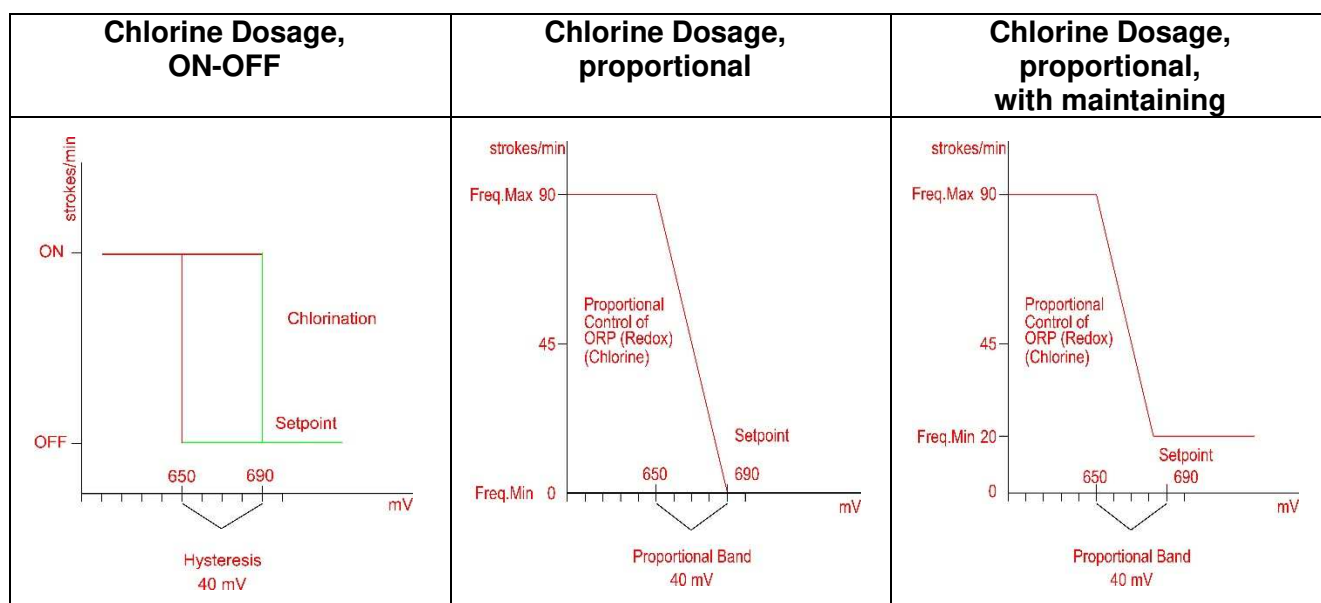
ORP Control with CHLORINE or OXIDANT Dosage

The crucial parameters which control this working mode are:

Menu	Sub-menu	Parameter (example)
Operat.Mode	ORP-meter	
Adjustment	Type	Proportional / ON-OFF
	Dosed Product	Chlorine
	SetPoint	(690 mV)
	Proportional Band / Hysteresis	(40 mV)
	Max Dosage *	(00:03) hh:mm (3 minutes)
Dosage	Max Frequency	(90) strokes per minute

* **Max dosage:** This functions controls the correct functioning of the pump. If the setpoint is not reached within the set time, the pump stops and triggers an alarm status.

This function allows to avoid dangerous dosages, for example in case of measurement sensor failure or breakage of the injection line.



ON-OFF Adjustment: quick adjustment, useful for systems that not require to keep the value near the SetPoint, but are affected by abrupt changes due to sudden fluctuations in the plant.

The parameters controlling the system behaviour are the hysteresis and pump working frequency.

PROPORTIONAL Adjustment: progressive adjustment, useful for systems that need to keep the value near the SetPoint, avoiding abrupt adjustment variations.

The parameters controlling the system behaviour are the proportional band and pump working frequency. The setting of these parameters is crucial to ensure a good adjustment of the system.

Any maintaining dosage (min frequency >0) is used only for special applications, which require a constant minimum correction (to always be used in case of external consent connected to a device determining the maintaining need).

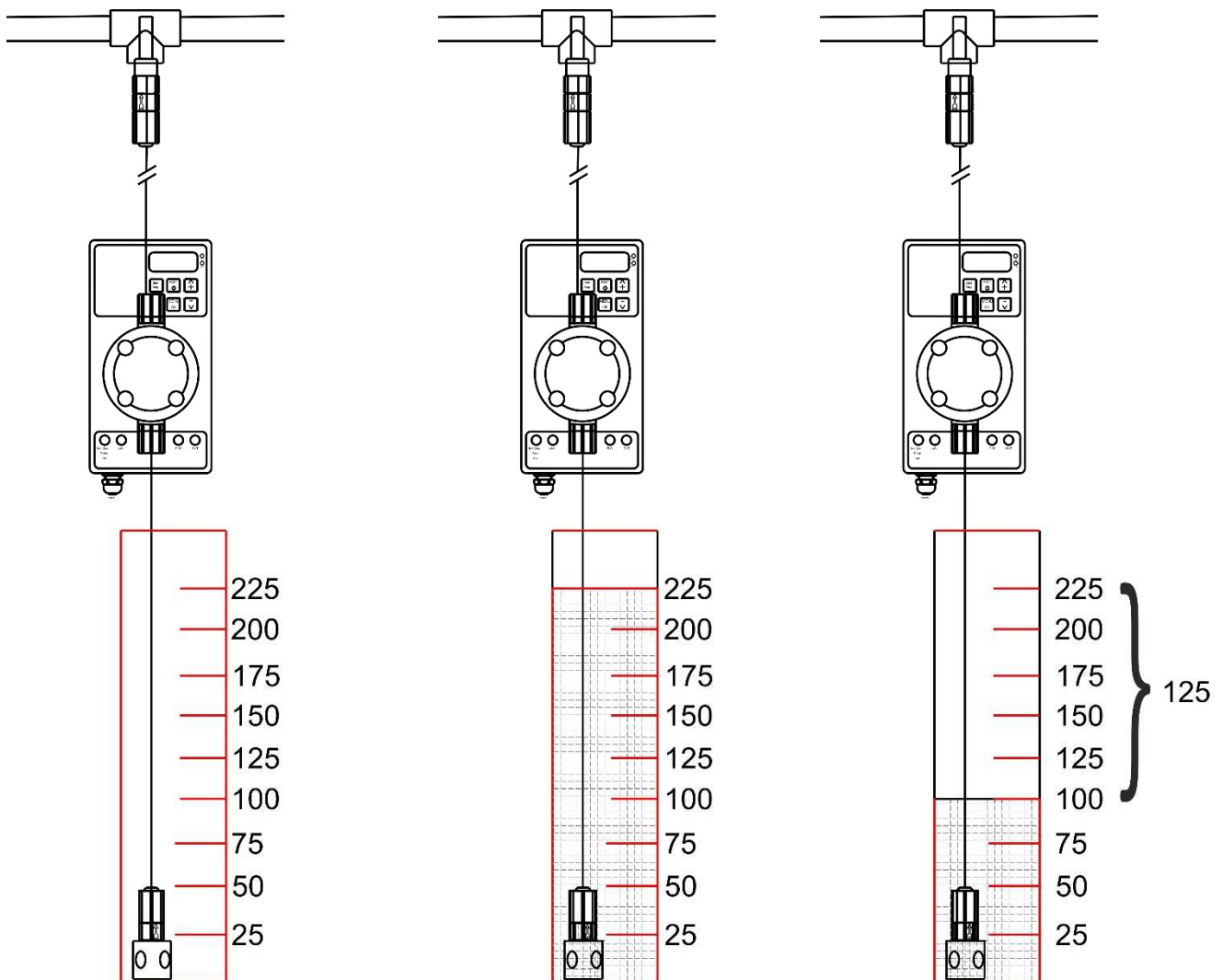


For all applications involving proportional dosing in ppm, displaying of hourly flow rate and counting of the dosed litres, performing a pump calibration procedure is needed.

The dosage volume depends on the hydraulic operating condition of the pump. In fact, the back pressure at the injection point and the length of the dosing hose determine the volume variation of each dosing stroke and, consequently, the hourly flow rate of the pump.

Requirements:

- 1) The pump has to be installed in its final location and dose at the final working point at the nominal working pressure at which it will dose.
- 2) Get a 500 / 1000 ml graduated cylinder, in which to insert the foot valve of the suction hose.
- 3) Use the liquid to be dosed in your application.
- 4) The calibration procedure will be started only after complete filling of the suction and injection hoses, with no air bubbles.





Procedure for the hydraulic calibration of the pump:

Menu Dosage MENU OK		The pump calibration procedure is lead by a specific sub-menu of the "Dosage" menu.
↑ + ↓ - START STOP START STOP ↑ + ↓ - MENU OK	Dosage Pump Calib. Pump Calib. OK->Go Go -> Start 0Π 180Π/m End -> Stop 200Π 180Π/m Sucked Vol. 125 mL Inject. Vol. 06 mL	Within the "Dosage" sub-menu, confirm the "Pump Calib." option. Press the START/STOP button to start the sucking cycle (it is advisable to make the pump perform approx. 200 dosing strokes) When the liquid level reaches a mark easily readable, stop the pump by pressing again the START/SOP button. Calculate the sucked volume (also see drawing on the previous page) and enter it in the parameter "Sucked Vol." Once the value is confirmed, the pump displays the volume which will be injected at each dosing stroke (Inject. Vol.).



Message	Cause	Meaning / Action
PowerOn mm:ss	A start delay has been set.	The countdown (in min : sec) before the pump enters the normal working mode is displayed.
No Level !	The LEV (level) input disables the dosage. <u>Note:</u> The factory setting is NO contact → when the contact closes, the dosage stops.	Configure correctly the input in the “Inputs \ LEV” menu. Check the electrical contact of the level switch. Check, and if necessary restore, the liquid level in the suction tank.
Ext.Cons. !	The EXT CONS input disables the dosage. <u>Note:</u> The factory setting is NO contact → when the contact closes, the dosage stops.	Configure correctly the input in the “Inputs \ Ext.Cons” menu. Check the electrical contact of the connection.
Sample Water !	The SW input disables the dosage. <u>Note:</u> The factory setting is NC contact → when the contact opens, the dosage stops.	Configure correctly the input in the “Inputs \ SW” menu. Check the electrical contact of the connection.
Stop !	The red key (START)/ STOP has been pressed	Press again the red key START /(STOP) to restart the pump.
Tech. Service	The maximum limit for the volume to be dosed between two subsequent maintenances has been exceeded.	Perform an hydraulic maintenance of the pump. Check the configuration in the “Counters \ ServiceCount” menu.
U.R. (Under Range) O.R. (Over Range)	Input signal outside the allowed range.	Check sensor and connection cable to MEAS input.

Error Message	Cause	Troubleshooting
Err.1 Err. Prog.	Configuration error, wrong setting of a parameter with not allowed value. Set data are not congruent.	Check set values.
Err.3 Err. Volume	The hydraulic calibration is not correct. The injection volume is not congruent with the pump size.	Perform a calibration procedure and check hydraulic data tables of the pump.



The periodic maintenance is of fundamental importance for the good functioning of the pump and its duration over time. Should be performed in a systematic and precise way, following all the indications given here below.



The pump maintenance must be carried out ONLY by qualified technicians and using ONLY original spare parts!

DOSING PUMPS

Pump Decommissioning



Thoroughly clean the pump housing, dosing head and the whole dosing line (see next paragraph for details).

Take all necessary personal protective measures, also depending on the dosed chemical.

- Ensure that the system is depressurized.
- Unplug the pump.
- Empty the head by turning it upside down and draining off the dosing product.
- **Rinse the head with an appropriate liquid, taking special care if the pump has been used for dosing hazardous products.**
- In case of temporary decommissioning, respect the correct storage conditions: ambient temperature from -10 to +50 °C and RH max 92 %.

Periodic Cleaning of the Hydraulic Group

Recommended average frequency: once a month.

The entire dosing line must be cleaned: foot filter, suction hose, suction valve, drain nozzle, bleed valve, dosing head, delivery valve, delivery hose, injection valve.

This operation is performed by first flowing clean water and then a dilute acid solution, for example 3% hydrochloric acid solution.

Periodic Checks

In case of normal use of the pump (about 30% of continuous operation), it is advisable to perform the following **checks every three months**. In case of higher stress (for example, continuous operation), a shorter interval is recommended.

- Check the integrity of the diaphragm (if dosing products that can damage the membrane, as abrasive additives, check more often)
- Check that the suction and injection hoses are securely attached to the pump
- Ensure that there are no bottlenecks in the injection tube
- Check that the suction and discharge valves are secure
- Check the tightness of the dosing head, verifying that no liquid leaks from the drain hole
- Check the integrity of electrical connections
- Ensure that the pump housing is intact
- Check that the head bolts are tighten
- Check the proper functioning of the bleeding valve

Weekly Checks

- Check the feed liquid level in the suction tank
- Check that there are no impurities or dirt in the suction and injection hoses
- Check the foot filter for clogging, that can cause the decrease of flow rate



Cleaning Operations and Replacement of Wearing Parts



Attention to dosed chemicals! Before any operation on the pump, discharge the liquid from the pump head and pipes. Take all necessary personal protective measures (i.e. gloves and goggles), as indicated in the SDS of the chemical, which must be always available and updated.



Before any intervention, unplug the pump or disconnect it from the mains. Depressurize all the hydraulic components of the plant.

Also refer to the exploded view of dosing heads, available in the relevant section of this manual.

Valve Cleaning

In case of pump malfunctioning, clean the suction and discharge valves, by disassembling them one by one so as not to exchange the pieces.

After this operation or valve replacement, it is necessary to recalibrate the pump.

- Using an Allen key (or similar tool), enter through the small connecting hole and push out the valve inserts.
- Pay attention to the flow direction of the fitting, that is different for suction and delivery.
- Please note that:
 - The inserts of suction and delivery valves are identical.
 - Under the inserts there is a spacer.
 - In the dosing head is placed a shaped seal (not O-ring).

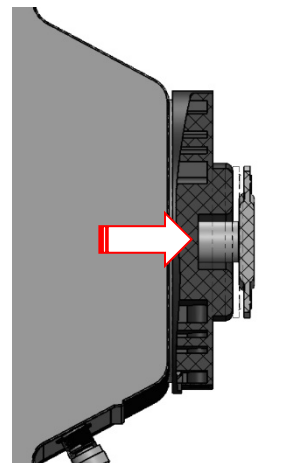
Replacement of the Dosing Membrane

- Empty the pump head by turning it upside down and letting the liquid flow out; then rinse with water or other suitable liquid.
- The pump must be connected to the power supply!
- Remove the screws and disassemble the dosing head from the pump housing.
- Enter configuration mode:
Menu – Service
 - **PSW** = XXX (firmware version displayed at start-up, e.g. 101)
 - Diaph. Time
 - PSW Reset
 - Pump Strokes

Replace Diaph. OK → Go

The pump energized the magnet and pushes the diaphragm outwards for 10 seconds, during which you must proceed as follows:

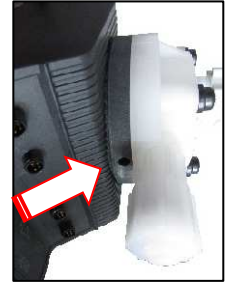
- Hold the pump housing with one hand and grasp the diaphragm with the other, located between the dosing head and the backplate.
- Slightly twist counterclockwise the dosing head and the backplate to loosen the diaphragm from the motor pin, the unscrew it completely.
- In the meantime, the pin returns to its rest position.
- Remove backplate and check the safety membrane conditions; if necessary, replace it.
- Push the safety membrane on the motor shaft until it is thoroughly flat over the pump housing; do not push it over!





- Correctly place the backplate on the pump housing, paying attention to not deform the safety membrane.

Warning! The drain hole must point downwards when the pump is fully assembled.



- Place the diaphragm on the backplate and remove any dirt from the thread.

- Enter configuration mode:

Menu – Service

→ **PSW** = XXX (firmware version displayed at start-up, e.g. 101)

Diaph. Time

PSW Reset

Pump Strokes

Replace Diaph. OK → Go

The pump energized the magnet and pushes the diaphragm outwards for 10 seconds, during which you must screw properly the diaphragm onto the motor pin, turning it clockwise until it is firmly in place.

Warning! This operation must be carried out accurately, for ensuring a correct dosage of the pump.

- Place the dosing head with the screws on the dosing membrane and on the backplate. The suction fitting must point downwards when the pump is fully assembled.
- Slightly screw the bolts, then tighten them crosswise.

Warning! Check the screw torque after 24 hours of operation! Check again after three months.

pH and ORP ELECTRODES

Typically, it is recommended to clean the electrode when the response is slow or measurements are not reliable, and when it has been used for a long time, especially in aggressive solutions, pollutants, very acidic or very alkaline environments.

To have your electrode at top performance, the sensing bulb must always be kept moist. Never store the electrode in distilled water, but use the appropriate solution.

A kit of solutions is available, for the cleaning and storage of pH and redox electrodes.

The kit includes three solutions:

- Solution A: dip the electrode in this solution for cleaning it
- Solution B: use this solution to rinse the electrode, before and after cleaning
- Solution C: storage solution to be used for filling the electrode protective cap when the electrode is not used (wintering, closure of the plant)

Electrode Life

Measurement probes are subject to a natural ageing even if they are correctly handled. Please notice that the average life of an electrode varies from 6 to 18 months, depending on the application.



MESH FILTER

The mesh filter cartridge is used to remove any suspended solids and sediments in the water, suitable for the treatment of drinking water, water for domestic use, for swimming pool and process applications; it is washable and inserted in a down-flow electrode-holder with cup.

For periodic cleaning of the filter, simply unscrew the cup, then remove and wash the filter cartridge. Finally assemble the filter again taking care to correctly position the O-ring seal.

The frequency of cleaning depends on the quality of the inlet water.



Before performing any maintenance action, ensure that the system is electrically and hydraulically insulated.

Note: *Some installation are equipped with a valve that controls the water inlet to the filter. Open the valve to allow the water to flow towards the measurement system.*

DISPOSAL

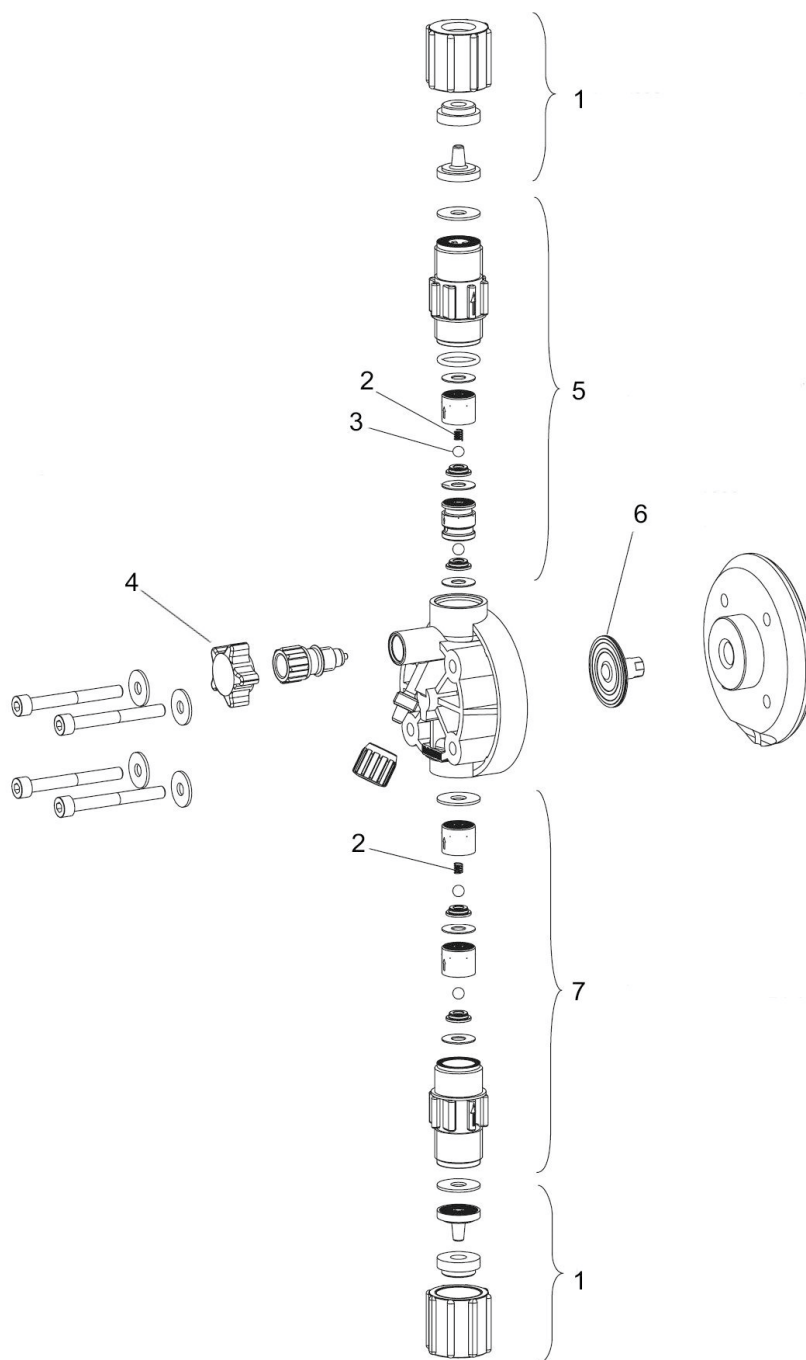
Thoroughly clean the system, by taking all necessary personal protective measures, also depending on the dosed product.



Electrical scrap is a special waste!
Comply with all applicable regulations for proper disposal.



Exploded View of Dosing Head



1	Connection kit, including threaded ring, locking ring and hose-holder nozzle
2	Spring (optional accessory for the dosage of medium viscous liquids)
3	Ceramic ball (PTFE on request)
4	Bleeding valve
5	Complete discharge (delivery) valve
6	Dosing diaphragm (membrane)
7	Complete suction valve



ACCESSORIES AND SPARE PARTS

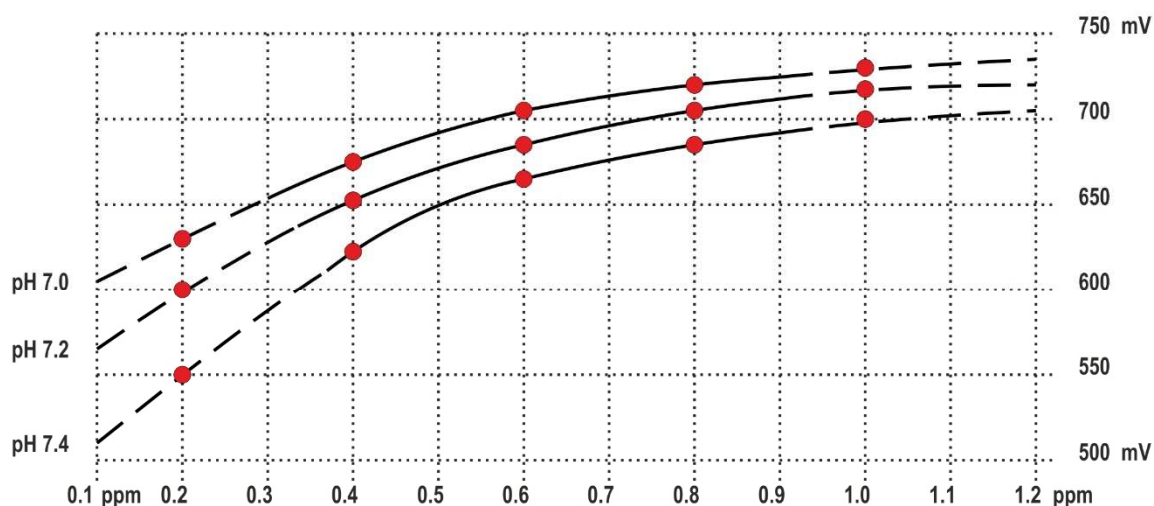
Item	Description	Part No.
EURO4111-PH	pH Electrode with plastic body, 1 m cable and BNC connector	80094111
EURO4111-RX/Pt	ORP Electrode with Pt sensor, plastic body, 1 m cable and BNC connector	80194111
SF17	Down-flow electrode-holder with transparent SAN cup, IN/OUT fittings for hose 6x8 mm and installation bracket	80810011
PP filtering cartridge with 80 µm washable mesh		80710034
Transparent SAN filter-holder cup, complete with O-ring		80710031
PP fitting for hose 6x8 mm, complete with O-ring		97000164
PE hose 6x8 mm, 100 m skein		36501008
S92/T	Electrode-holder, PP, ½" GAS M connection	80820005
IL-SF	In-line flow sensor	97009202
Kit 05 PKT	Complete maintenance kit for standard head, PKT 0512	97003001/PKT
Kit fittings	Kit of fittings for hose 4x6 mm	97003090
Diaphragm 05	Spare dosing diaphragm for pump 0512	97003011
Injection valve	Injection valve PKT, connection for hose 4x6 mm	97003030/PKT
Foot filter	Foot valve PKT with filter, connection for hose 4x6 mm	97003020/PKT
Kit standard 4x6	Kit of accessories for pump with fittings for hose 4x6 mm: suction hose (PVC Crystal, 2m), delivery hose (PE, 5m), PKT foot valve with filter and PKT injection valve	97003200/PKT
PVC Crystal hose 4x6 mm, 100 m skein		36502103
Semi-rigid PE hose 4x6 mm, 100 m skein		36501003
SLP5	Level probe with 2 m cable and plastic M8 connector	97009008
pH4-S	pH 4 Buffer solution, 90 ml bottle	80090095
pH7-S	pH 7 Buffer solution, 90 ml bottle	80090096
RX220-S	ORP calibration solution at 220 mV, 90 ml bottle	80190091
KRE	Solution kit for cleaning and storage of pH and ORP electrodes	80099902
Kit B	Installation kit, which includes 2 PVC valves M/F ½", 2 fittings with PP threaded ring ½", PE hose 6x8 mm (5 m)	80509915

Correspondence Curve mV / ppm Chlorine

The below diagram shows how to build the mV (ORP) / ppm Chlorine correspondence curve, so that the ORP (redox) readings can be used to adjust the chlorine level.

HOW TO BUILD THE REDOX / ppm CHLORINE CURVE, SPECIFIC FOR YOUR SYSTEM

- 1) Stabilize the pH value to 7.0
- 2) Bring the chlorine level at 0.1 ppm, and check with the DPD1 TEST
- 3) Read the displayed REDOX value and draw the first point of the curve
- 4) Then bring the chlorine level at 0.3, 0.5, 0.7, 0.9, 1.1 ppm, reading the related REDOX values after stabilization, and draw the remaining points of the curve
- 5) Draw the curve by linking the points. At the stated pH value, this curve will be used to interpolate the ppm concentration of chlorine from REDOX measurements
- 6) Now stabilize the pH value to 7.2 and 7.4, respectively. Then for each of these values, build the curve as explained here above



Dashed curve are purely indicative



CAUTION! NEVER LET THE SOLUTION TANKS GO EMPTY!