



Colorimetric Unit MCO14_EVO (v.0426)



TECHNICAL MANUAL

Man. 07191 rev.3.1

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 instructions prescribed in this manual.

PRIOR TO PERFORM ANY OPERATION IT IS MANDATORY TO READ THE WHOLE MANUAL!

The manufacturer declares that the information contained in this manual is consistent with technical and safety specifications of the device to which the manual refers.

The manual must be kept by the user and/or personnel responsible for the management and maintenance of the device. In the event of deterioration or loss, a copy may be requested from the manufacturer.



Based on its design and construction, this instrument complies with the essential safety requirements and the following EC directives: 2014/35/UE; 2014/30/UE; CEE 93/68. The relevant harmonized standards on Safety, Immunity and emission have also been applied.

HEALTH AND SAFETY

The manufacturer cannot be held responsible for accidents or damage resulting from inappropriate use of the device, as well as from even partial failure to comply with the safety regulations and intervention procedures described in this manual.

During the configuration and subsequent use of the device, incorrect operating situations may occur that are not foreseen in this manual. These anomalies can sometimes be caused by environmental factors or by fortuitous failures that cannot be foreseen by the manufacturer.



All maintenance or repair must be performed with the system isolated both electrically and hydraulically.



Warning! Before performing any kind of start-up operation on the system, carefully read the HSDS of the reagents to be used, to define the proper behaviours to be followed, and the personal safety equipment to be worn.

The use of non-original reagents STEIEL prejudices the proper functioning of the colorimetric unit and invalidates any warranty!

WASTE DISPOSAL



Disposal of the electronic device and consumables must be carried out in compliance with current local regulations.

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

Warranty

All STEIEL 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.

The warranty does not extend to any damage caused by incompetence or negligence in the use of the device or by poor or omitted maintenance.

Any repair or modification made to the device by the user or unauthorized technicians will result in the forfeiture of the warranty.

Failure to comply with the methods of intervention and use of the device described in this manual will result in the forfeiture of the warranty.



Do not remove the identification labels of panel, instrument and pumps! It is in fact necessary to communicate the product code and/or serial number for correct identification of the spare parts.

Removing or tampering with the label completely invalidates the warranty!

How to ship the instrument

To send back the device for repairing or calibration purposes, clean it properly to eliminate any hazardous residuals.

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PACKING LIST

The **MCO14 EVO** control unit is supplied complete with:

- 1) EURO2010-pH, glass-body pH electrode
- 2) EURO2110-RX/Pt, glass-body ORP electrode with platinum sensor
- 3) PT100S temperature sensor (for model MCO14/5_EVO)
- 4) Installation kit (Kit A): 1 PVC valve (M/F, 1/2"), 1 PP fitting with 1/2" threaded ring, PE hose (6x8 mm, 5 m)
- 5) Screws and dowels for wall installation
- 6) Instruction manual

INTRODUCTION AND MAIN TECHNICAL NOTES

MCO14 is a rational and accurate system for managing analyses and controlling the main parameters in the pool waters.

The unit can monitor pH, redox and temperature levels using proper probes, and it is also equipped with a colorimetric control system of free and total (combined) chlorine. This kind of analysis is more precise and reliable than amperometric measurements, because readings are performed by an optical system, which avoids errors due to temperature variations or chlorination agent (hypochlorite, isocyanurate, etc.). This device features user-friendly configuration and calibrations menus, 2-row LCD, digital and analogic outputs completely settable through software, and a serial port for communication with PC or modem for remote control. Inputs can be factory set according to customer requests.

Other important technical characteristics include:

- 1) Multi-language interface
- 2) Five measure inputs; if both free and total chlorine analyses are performed, the measures become six, because the combined chlorine is calculated as the difference between total and free chlorine
- 3) Digital outputs: relays configurable as set-point, max. or min. alarms, timed proportional control (PWM), pulse proportional control (PFM), scheduled adjustments
- 4) Possibility to have a low voltage output (24V~), for driving small dosing pumps or solenoid valves without adding transformers and with safety voltage; max 20VA of power consumption (to be requested upon order)
- 5) Analog outputs for exporting measurement values to external devices; with galvanic separation
- 6) OFF input for disabling control relays (to be connected to the filter pump contactor)
- 7) FLOW input for monitoring the water flow to the equipment
- 8) IMP input to freeze measurements when the plant is not working, or for synchronization with automatic cleaning
- 9) OK output for remote indication of correct operations
- 10) Alarms and errors (diagnostic) directly shown on the display
- 11) Date and time label always displayed, even in case of power failure
- 12) Configuration and calibration data saved on non-volatile memory for at least 10 years
- 13) Data log downloadable through serial line
- 14) RS485 serial line with galvanic separation and Modbus RTU communication protocol.

OPERATING PRINCIPLE OF COLORIMETER

Water to be analysed comes from the inlet hose, and remains at the constant level determined by the spillway. As the analysis is requested, the water goes through the solenoid valve to the measurement cell. First a turbidity reading is performed, and the zero calibration is done. Then the two reagents are injected and properly mixed. If water contains free chlorine, the reagents develop a red colour with an intensity depending on the chlorine concentration. The detector reads the colour and transmits the information to the microprocessor, that gives the chlorine concentration in ppm units. This value is stored till the next analysis cycle. If total chlorine analysis must be also performed, the cycle continues by adding and mixing the third reagent and measuring the new colour to obtain the total chlorine concentration in ppm units. After the cycle is completed, the solenoid valve is open to discharge the analysed water and allow the measurement cell cleaning.

TECHNICAL DATA

Standard Configuration:

- In1 (M1) = pH**
- In2 (M2) = ORP (redox)**
- In3 (M3) = not used**
- In4 (M4) = free chlorine with DPD1 colorimetric analysis**
- In5 (M5) = temperature**
- In6 (M6) = total chlorine with DPD3 colorimetric analysis**
- (M7) = combined chlorine (calculated as M6 – M4)**

Input Specifications

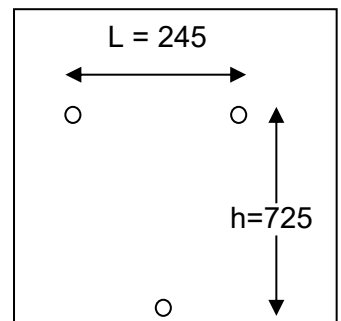
Cl _F	Free Chlorine: 0.00 ... 5.00 ppm – with colorimetric method (resolution 0.01 ppm; precision better than ± 0.05 ppm up to 1 ppm Cl ₂ , ± 0.15 ppm from 1 to 2 ppm, ± 0.25 ppm from 2 to 5 ppm)
Cl _T	Total Chlorine: 0 ... 6.50 ppm – with colorimetric method (optional) (precision better than ± 0.02 ppm, repeatability better than ± 0.01 ppm)
Cl _C	Combine Chlorine: value obtained from the difference Cl _T – Cl _F
pH	0.00 ... 14.00 pH; input impedance > 10 ¹² Ohm (precision better than ± 0.02 pH, repeatability better than ± 0.01 pH)
ORP	–1000 ... +1000 mV; input impedance > 10 ¹² Ohm (precision better than ± 0.02 mV, repeatability better than ± 0.01 mV)
Temperature	0.0 ... +100.0 °C; input from Pt100 sensor (Pt1000 upon request) (precision better than ± 0.3 °C, repeatability better than ± 0.2 °C)

Note: Precision and repeatability data refer to the electronic unit only.

Display	Two-row (x 16 characters) alphanumeric LCD, with backlight
Power Supply	230 V~ $\pm 10\%$, 50-60 Hz, 45 VA (110 or 24 V~, 50-60 Hz upon request)
Hydraulic Supply	approx. 50-60 l/h, inlet on hose holder with OD 12 mm; overflow and outlet of analysed water (to be disposed) on hose holders with OD 22 mm (each analysis requires approx. 1 litre of disposable water)
Reagent Tank Volume	1 litre for reagents 1 and 2; 0.5 l for reagent 3 (each analysis uses approx. 0.1 ml of reagents 1 and 2)
Autonomy	With full tanks, at least 10000 analyses can be performed; with sampling time of 10 minutes, the autonomy is 100000 minutes, i.e. 1667 hours, equivalent to 69 days. Anyway, it is not recommended to leave the reagents inside the colorimeter for more than 2 months, to avoid alterations, especially if the device is installed in a warm environment.
Relay Outputs	available on removable terminal blocks: <u>4 control relays</u> (K1, K2, K4, K5); can be driven by any of the five measurements; <u>1 alarm relay</u> (K3); normally energized, it deactivates upon anomalies; can be also set as NO; K1, K2 and K3 have contact load max 250V~, 3A resistive, while K4 and K5 have load max 24 V (V~ or V-), 3A. Standard factory configuration: • K1 and K2 = output 230 V~ • K3, K4, K5 = voltage-free contact

Note: upon request, the K4 and K5 outputs can be configured as 24V~ voltage (max. 20 VA) for direct driving of solenoid valves, or as PFM outputs, compatible with the pulse input of dosing pumps.

Analog Outputs	2x 0/4-20 mA outputs, selectable for any measurement (selection through software), with galvanic separation from inputs and microprocessor; max load: 700 Ohm; max error: 0.2% FS	
Inputs	accept voltage-free contact; OFF: contact from the filter pump contactor; if active, disables outputs; can be set as NO or NC acting on the S36 jumper <u>Warning! The remaining jumpers (S37...S41) are factory set and should not be tampered by the user for any reason!</u> FLOW: contact from hydraulic flow sensor LEV1: contact from level sensor of tank 1 LEV2: contact from level sensor of tank 2 LEV3: contact from level sensor of tank 3 IMP: contact for measurement freezing when the plant is not working or synchronization with automatic cleaning	
Serial Line	RS485, available on miniaturized 4-pin terminal block	
Environment	Storage temperature	-20 ... +60 °C
	Working temperature	0 ... +50 °C
	RH max	90% no condensing
Protection Rate	IP56	
Dimensions	L 520 x H 900 x W 250 mm	
Installation	Using the supplied screws and stoppers; first drill the two top holes and hang the device, then drill the fixing hole on the bottom	
Cable Glands	5 x PG9 for clamping cables of dia. 5 ... 9 mm	
Weight	approx. 13.5 kg	



NOTES AND GENERAL ADVICE

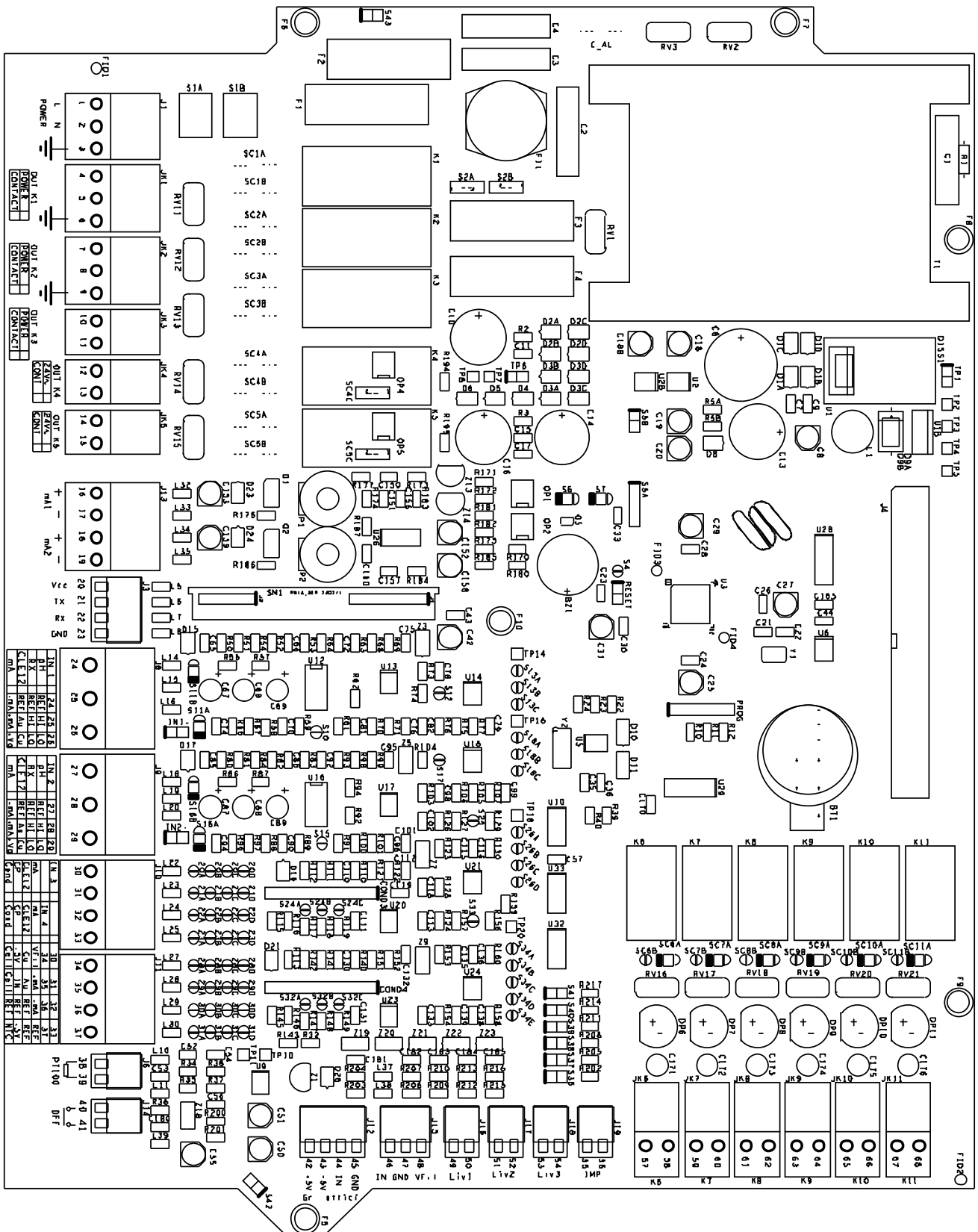
- 1) The control unit (electronic device) should be installed **as far as possible from heat and humidity sources**.
- 2) After completing the installation, **carefully tighten** the cable glands, close the terminal block compartment and front cover, to protect electronic components.
- 3) If the unit does not switch on even when powered, check fuse F2 (0.5A); if the controller turns on but cannot supply voltage at the 230V~ outputs, check fuse F1 (4A); if the unit turns on but does not power the 24V~ outputs, check fuse F4 (2A). The fuse locations are shown in the “Electrical Connections” section. The fuses should be substituted by technical personnel only and using spare fuses of the same size and rate of the original ones.
- 4) In general, the sensor connection cables must be as short as possible and located far from power cables.
- 5) Exchanging the line and neutral connections of the power supply does not affect the correct functioning of the unit, but the internal protection fuse (F1) will be connected to the neutral instead of to the phase. Consequently, also the line and neutral of the 230 V~ outputs will be exchanged.
- 6) The grounding of the power line (terminal 3) must be connected to the grounding of the electrical system. The connection is not required for safety purposes because MCO14 is a Class II device, but it is essential to eliminate any electrical interference from the mains.
- 7) The max load of the K1, K2 and K3 relay outputs is 3A @ 250V~ resistive; with inductive load the max current is 1A (with 230V~ power supply, small pumps or solenoid valves with power consumption up to 250VA can be directly driven). For K4 and K5 outputs, it is recommended to not exceed the 24V~ safety voltage.
- 8) In case of 24V~ outputs, the maximum power is 20VA; any overload may burn the protection fuses.
- 9) In case of inductive load, the outputs should be protected with proper arch and interference suppression systems (RC networks or varistors in AC, diodes or varistors in DC). Internally the device is equipped with suppressors appropriate for 230V~ on K1, K2 and K3, and suppression systems for 24V~ on K4 and K5. A proper interference suppressor should be chosen by the user accordingly with specific load / power supply.
- 10) To have your device always at its top performance even in noisy environments, it is recommended to follow the below instructions:
 - a. Insert radio frequency block ferrite on the power supply cable
 - b. Connect to the grounding system the metallic shield of the input cables
 - c. Install RC suppressors (or similar device) in parallel with the load (choose proper size)
 - d. Perform an efficient grounding connection of the equipment
 - e. Ground the cables of the current outputs longer than 20 meters
- 11) **The unit should be always on**, to avoid polarization delays of the sensors, with consequent control errors. If it is not necessary to use it for several hours (e.g. at night), it is recommended to lock the operation through the internal clock (see “Configuration” section) or through the activation of the OFF contact (for example by connecting it to a voltage-free contact of the filter pump contactor).

SPECIFIC ADVICE FOR COLORIMETER

- 12) **Make sure that from the inlet to the unit does not come solids** (such as hair, sand, insects, etc.). These solids easily clog the filter inlet, altering or blocking the measurement. Moreover, if organic substances stop in the filter, these can combine with chlorine and lower its level in water, and the reading will be lower than the actual value. It may be useful to connect the water sampling for analysis after the filter or install an additional filter.
- 13) **Free discharges are requested**, to prevent regurgitations from spillway or water overflowing of the reading chamber, with possible leakages from the injectors.
- 14) **The overflow discharge is recoverable**: this is pool water as such that has only lapped the electrodes. If the unit is above the balance tank, the recovery is by fall.
- 15) **At start-up** select the “manual operation” mode to **start the peristaltic pumps**. Through this function, make reagents flow into the reading chamber and check the tubes for air bubbles. If air bubbles are present, make the pumps work until complete expulsion of bubbles. To facilitate this operation, it is advisable to keep the tube containing air bubbles in vertical position.
- 16) **First analyses after the start-up may give unreliable results**. This setting phase depends on thermal variations, cleanliness of the optical groups and adaptation of the tubes/injectors.
- 17) **In case of heavy chlorination**, above 7...8 ppm, the DPD reagent turns red for a few seconds, then returns to be transparent. In this condition the unit indicates a low chlorine level and, if the chlorine dosage system is connected, the unit will continuously dose chlorine. This undesired behaviour is not specific of the MCO14 controller but depends on the DPD method used for photometers. Usually, this anomaly is caused by manual hyper-chlorination, and, therefore, it is recommended to perform manual chlorination only with the colorimetric unit turned off.
Caution! Strong chlorination involves excessive fumes and consequent widespread oxidations, particularly on the mixer motor.
- 18) **Never remove the optical groups!** This operation will affect the unit calibration and void the warranty.
- 19) **The precision depends on chlorine concentration** to be detected. Up to 1 ppm, the maximum error is ± 0.05 ppm, and increases as the concentration increases. This limit depends on the DPD method and is common to all colorimetric controllers, so it is normal to find discrepancies between subsequent measurements or between different colorimeters at high chlorine concentrations.
- 20) At start-up the transmittance value may be low, such as to cause an error. This can be due to fogged lenses, as consequence of the thermal difference between the environment and the water to be analysed. The only thing to do is wait for the spontaneous evaporation of the condensate.
- 21) **FOR TECHNICAL PERSONNEL ONLY!** If the transmittance level of the unit is constantly lower than 60...70%, even after the settlement period or after the cleaning of optical groups, contact the manufacturer. Also contact the manufacturer if the transmittance is greater than 102%.

ELECTRICAL CONNECTIONS

To access to the terminal blocks, remove the front cover located below the keyboard panel.



All user connections are available on removable terminal blocks.

1. Power supply: first terminal block from the top; pins 1, 2, 3, named LINE, NEUTRAL, EARTH
2. Proceeding downwards, you can find terminals for the 5 output relays:
 - pins 4, 5, 6 = relay K1
 - pins 7, 8, 9 = relay K2
 - pins 10 and 11 = relay K3
 - pins 12 and 13 = relay K4
 - pins 14 and 15 = relay K5 (**Note: This output can also be used to connect the contact of an UV lamp ballast**)

If K1 and K2 are configured as voltage outputs (230V~), the output sequence follows the power supply sequence: LINE, NEUTRAL, EARTH.

3. The following are two current outputs:
 - pins 16 and 17 = positive and negative of the current output mA1
 - pins 18 and 19 = positive and negative of the current output mA2 (**Note: This output can also be used to connect an UV system with 4-20 mA input**)

4. Then you find the terminal block of the serial line, with the following pin-out:

Pin	RS485 port
20	+
21	A
22	B
23	GND

5. In sequence are the pins related to the inputs:
 - pins 24, 25, 26 – measure 1 input (pH): REF (reference), core (positive) and shield (negative) of the shielded cable, respectively
 - pins 27, 28, 29 – measure 2 input (ORP): REF (reference), core (positive) and shield (negative) of the shielded cable, respectively
 - pins 30, 31, 32, 33 – measure 3 input, not used in this version
 - pins 34, 35, 36, 37 – measure 4 input (free chlorine DPD)
 - pins 38 and 39 – measure 5 input (temperature): connect a Pt100 sensor
 - pins 40 and 41 – OFF contact: connect to these pins a voltage-free contact from the filter pump contactor (or, in general, a “system in function” contact); this contact can be NO or NC, because it is configurable through the S36 jumper. Be aware that LED OFF on the front panel turns on to indicate “disabled unit” and, therefore, outputs locked.

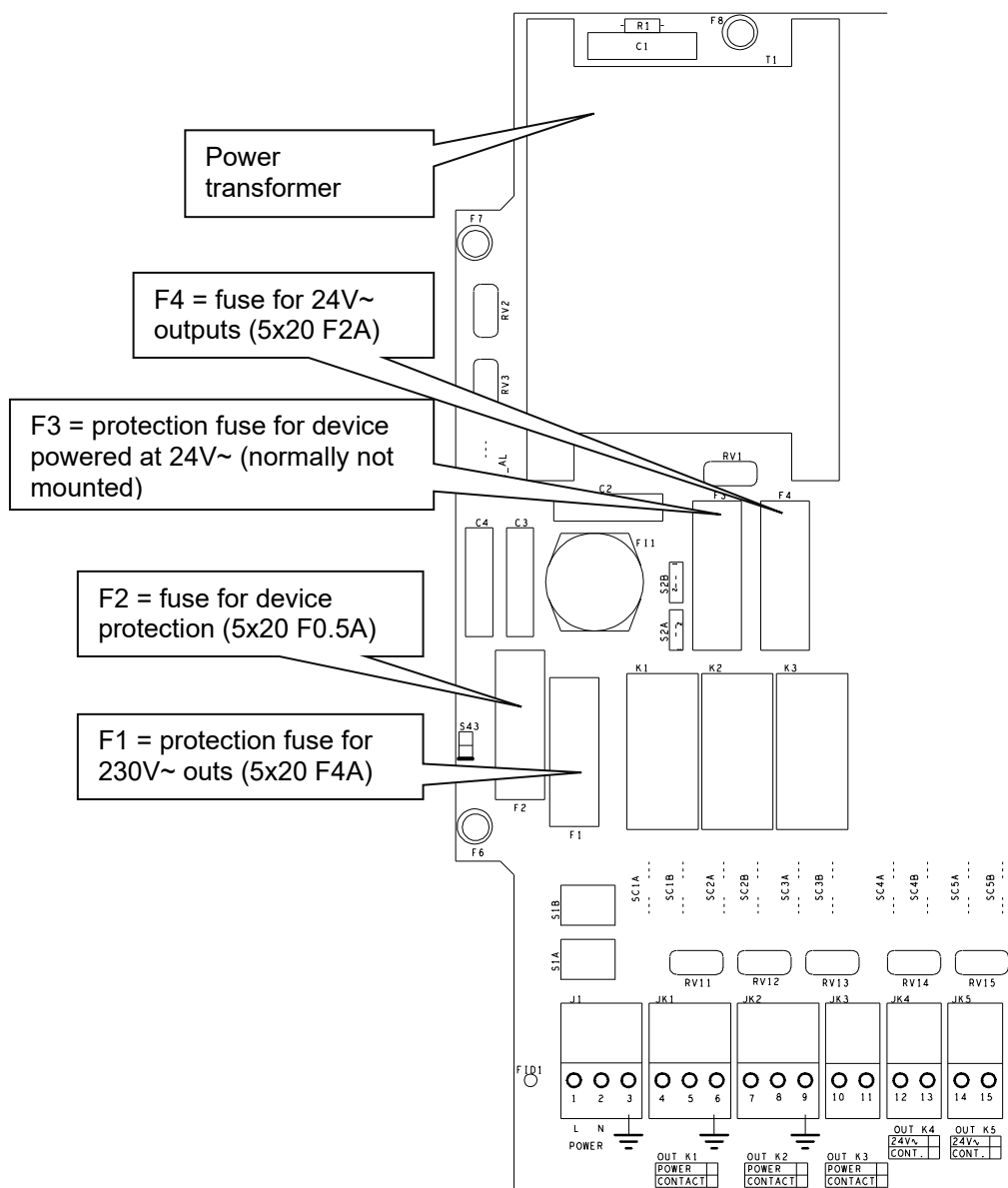


Note: All terminals not accessible from terminal block compartment, are reserved for different uses and/or factory wired, and do not require any intervention by the user.

In the side drawing, the power supply and output terminals are highlighted, together with the fuses and, for technical personnel, the jumpers for configuring contact or voltage outputs.

The jumpers for output configuration are marked from SC1 to SC5, referring to the relays from K1 to K5. Note that the outputs K1, K2 and K3 can be contact or voltage type (230V~, power supply voltage), while the outputs K4 and K5 can be contact type (relay), signal contact (for pulse input of dosing pumps) or at 24V~ (with internal power pack), to be specified / requested upon order.

The jumpers must always be moved in pairs. The contact configuration is obtained with the jumpers from the centre upwards, while the voltage configuration is obtained with the jumpers from the centre downwards.



Power supply
230V~
Acid dosing
pump (230V~)
Chlorine dosing
pump (230V~)
Alarm output
K4 output
K5 output



Warning! Move these jumpers without the permission of the manufacturer will void the warranty!

The side drawing shows the jumpers for input inversion.

OFF = input NO

ON = input NC

Starting from the right to the left:

S36 = input OFF

S37 = input FLOW

S38 = input LEV.1

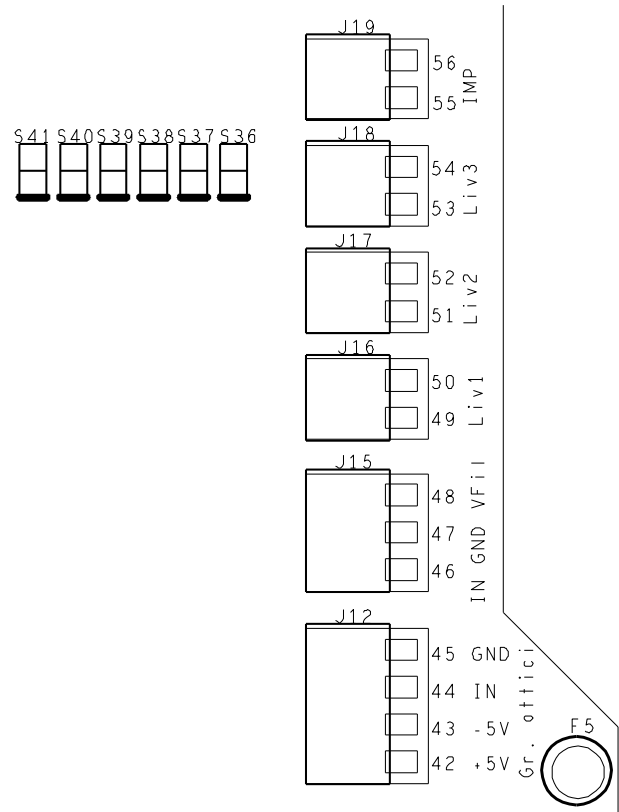
S39 = input LEV.2

S40 = input LEV.3

S41 = input IMP



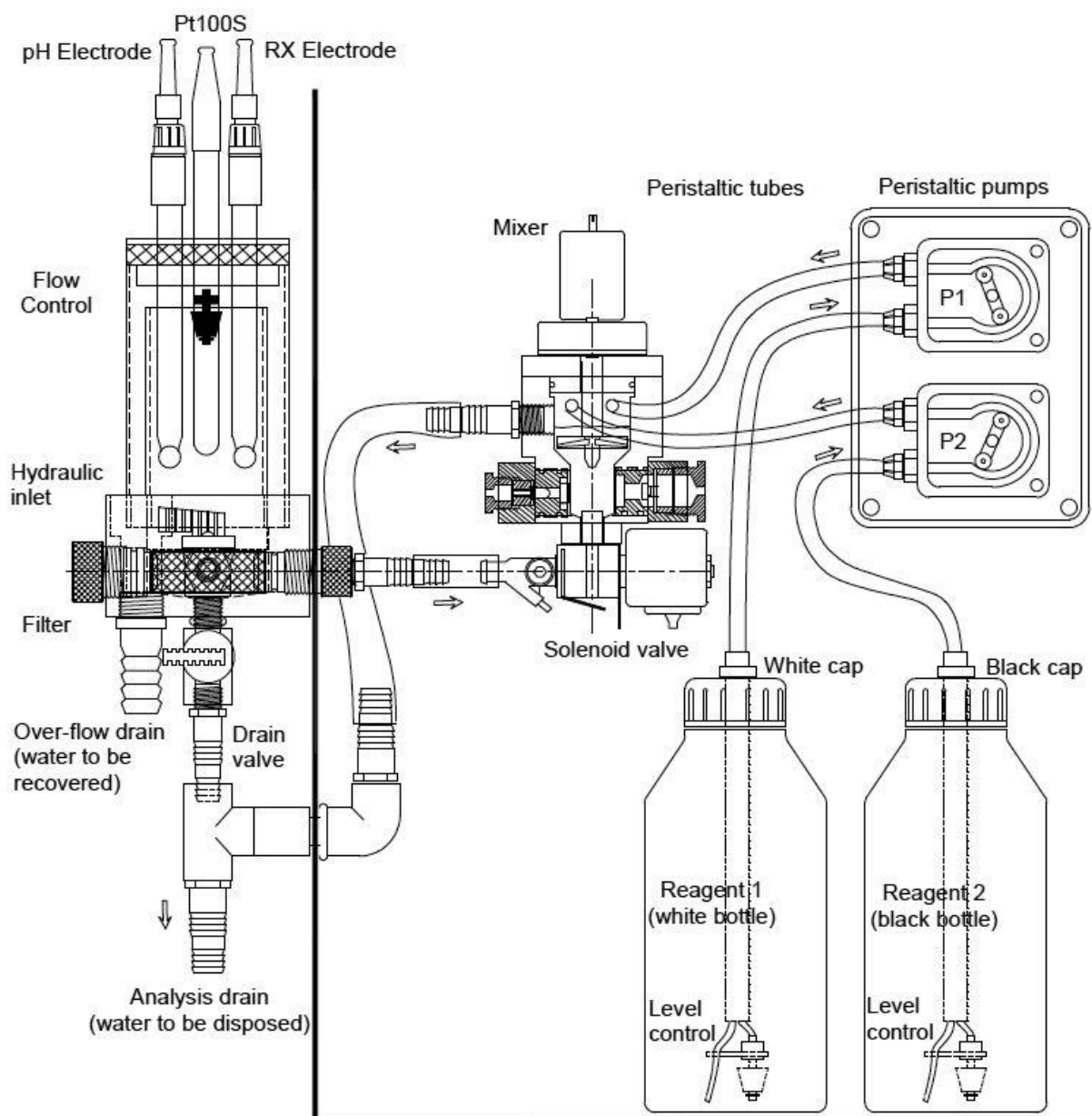
Warning! These jumpers are set at the factory and, except S36, do not require any user intervention!



For skilled technical personnel only:

- pins 42, 43, 44, 45 – connection of optical groups: connect the brown wire to terminal 42, the green wire to terminal 43, the yellow wire to terminal 44 and the white wire to terminal 45
- pins 46, 47, 48 – FLOW input: in case of contact sensor, use pins 46 and 47; in case of micro-magnetic sensor, connect the black wire to pin 46, blue wire to pin 47 and brown wire to pin 48
- Inputs for level sensors: contact inputs

HYDRAULIC CONNECTIONS



The above drawing is indicative and not to scale.

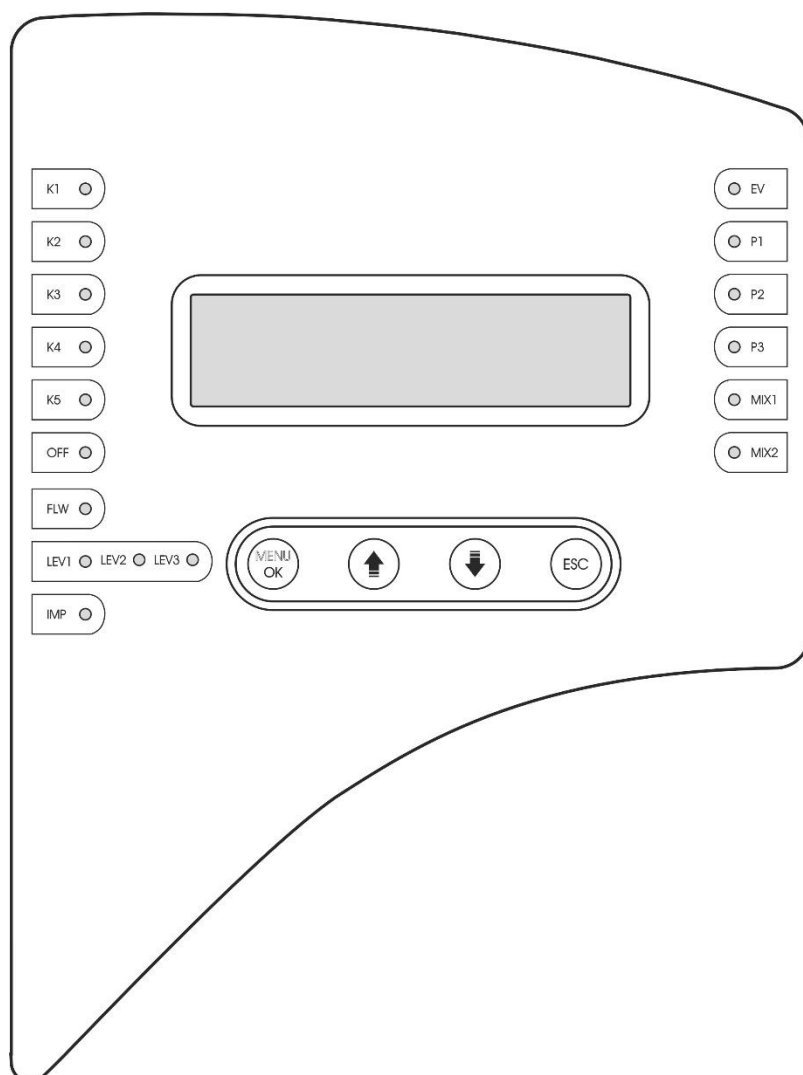
The third tank (0.5 L) and the third peristaltic pump are not shown (used only for total / combined chlorine analysis).

The liquid to be analysed enters through the inlet hose ($\varnothing \frac{1}{4}$ " for tube 12 mm), placed frontally on the spillway. Immediately after the hose, there is a ball valve, to be adjusted to obtain a minimum of water at the overflow outlet even when the solenoid valve is energized (so water enters in the analysis cell).

The spillway drain (water to be recovered) is provided on $\frac{1}{2}$ " hose, while the analysed water drain (to be disposed), is available on $\frac{3}{8}$ " hose.

The water feeding line must have a minimum pressure such as to ensure the correct water flow as set with the inlet valve. It is advisable to take it from a point with little turbulence (are bubbles are an interference). The outgoing liquid at the "analysis drain" contains the reagents used for the colorimetric test and must be neutralized before being discharged or disposed of in compliance with current regulations.

DESCRIPTION OF THE FRONT PANEL



- MENU/OK Key

Allow to access to CALIBRATION and CONFIGURATION circular menu, that can be explored with the arrow keys (↑ ↓):

- **Calibration of measure 1**
- **Calibration of measure 2**
- **Calibration of measure 3**
- **Calibration of measure 4**
- **Calibration of measure 5**
- **Calibration of measure 6**
- **Standard configuration**
- **Advanced configuration**
- **Set date / time**
- **Output tests**
- **Start colorimetric analysis**
- **Super chlorination**

Refer to specific sections for further details

- ↑ Key

Increase the displayed value in calibration and/or configuration mode

- ↓ Key

Decrease the displayed value in calibration and/or configuration mode

- ESC Key

Exit from calibration and/or configuration mode

- LED K1...K5 Light up to indicate the status of the related output (ON = contact closed)
- LED OFF Lights up to indicate an external request of shutting down the device
- LED FLW Indicates the presence of water flow to the system; turns off in case of lack of water, and outputs and colorimetric cycle are locked
- LED LEV1, 2, 3 Light up to indicate the presence of reagent 1, 2 and/or 3 in its tank; turn off in case of lack of reagent, and outputs and colorimetric cycle are locked
- LED EV Light up to indicate the energization of the solenoid valve
- LED P1 Light up to indicate that the peristaltic pump of reagent 1 is dosing
- LED P2 Light up to indicate that the peristaltic pump of reagent 2 is dosing
- LED P3 Light up to indicate that the peristaltic pump of reagent 3 is dosing
- LED MIX1 Light up to indicate that the mixer is operating
- LED MIX2 Reserved for future use

DISPLAY VISUALIZATIONS

In normal mode the display shows 4 measurements. A typical visualization may be for example:

	7	.	2	1	pH		0	0	6	9	1	mV	
	2	7	.	8	°C		0	0	.	7	8	Cl	2

In one or more boxes can be displayed, alternating with the measure chosen, any fault condition (for example, lack of levels or flow, off from internal clock, etc.). Refer to parameters P79...P82.

Press $\uparrow \downarrow$ keys to display additional info, in the following sequence:

- Details of measure 1 (pH) / measure 2 (ORP)
- Details of measure 3 (not used)
- Details of measure 4 (free chlorine)
- Details of measure 5 (temperature, if provided)
- Details of measure 6 (total chlorine, if provided)
- Details of measure 7 (combined chlorine, only if total chlorine is provided)
- Current date and time
- Software version
- Temperature of the electronic board
- Details of output relay K1 / K2 / K4 / K5

For example, pressing the $\uparrow$ key once, generates a screen that shows the measured pH value, the input signal (in this case, the value within brackets is the input with no thermo-compensation and no offset / gain addition), the offset "O" and gain "G" factors with respect to the electrical calibration (values indicative of the state of the input sensors).

		7	.	2	1	pH		(		6	.	9	5	)
O =		-	.	0	6		G =		1	.	0	1	3	

Current date and time are displayed in the following format:

T	h	u	r		1	6		O	c	t		2	0	1	4
					1	6	:	5	3	:	3	0			

The display of the relay details varies according to the specific configuration of each relay; for example, in the case of ON/OFF control, the screen will be as shown here below.

K	1		O	F	F			7	.	1	8	p	H	
T	₁	0	:	0	0	0		T	₂	0	:	0	0	0

Are shown the relay status (also reported by the corresponding LED on the front panel), the value of the associated measurement, any activation (T1) and deactivation (T2) delays, expressed in minutes and tenths of second.

In case of PWM proportional control, the screen will be as shown here below:

K	2			8	2	%		0	.	6	8	C	I	2
T ₁	3	:	1	3	6			T ₂	0	:	5	2	1	

Are displayed the adjustment percentage, the value of the associated measurement, the time base (T1) and the ON time (T2).

If a relay is programmed for a maximum operating time, that value is displayed in alternation with the reading. When the maximum operating time expires, the related alarm is triggered (see “Configuration” section for details).

If the relay is set for timed operation (see “Configuration” section for details), the screen will be as shown here below.

K	5			0	8	:	0	0		0	8	:	1	0
O	F	F		2	1	:	2	0		2	1	:	2	5

In this example the relay is activated from 08:00 to 08:10 and from 21:20 to 21:25. Specifically, times are set through parameters P35...P38 (see “Configuration” section).

If a relay is designed for PFM proportional operation, the screen will be:

K	4			6	0	%		0	.	8	2	C	I	2
				7	2			p	u	i	/	m	i	n

Finally, in case of time scheduled operations, a screen as the one here below will be displayed, which shows the times set through the related configuration parameters:

K	5			0	7	:	3	0		1	2	:	4	5
O	N			1	5	:	5	0		2	1	:	0	0

CONFIGURATION

The MCO14 unit features two configuration levels: **standard** and **advanced**.

The standard configuration is normally accessed by the end user, only to change the relay thresholds and the display language.

The advanced configuration instead allows to change all parameters and is normally protected by a password to prevent incorrect settings by unauthorized personnel.

The procedure is however the same for both configurations.

- 1) Starting from any screen, press the MENU/OK key
- 2) Calibration of measure 1 (pH) option is displayed
- 3) Press the $\uparrow$ key until the display shows the standard configuration option
- 4) Press MENU/OK to confirm, or ESC to exit (or use the $\uparrow$ $\downarrow$ keys to see different options)
- 5) If the option is confirmed, the display shows the first editable parameter. Now, press MENU/OK to change the displayed value, use the arrow keys to go to the previous or next parameter, or press ESC to exit the configuration menu
- 6) If the MENU/OK has been pressed at step 5, now use the arrow keys to set the desired value
- 7) Press again MENU/OK to confirm and store the new value, or press ESC to exit without saving
- 8) Proceed in the same way for all the parameters

C	A	L	I	B	R	.			M	1			p	H		
C	O	N	F	I	R	M			-	>			O	K		

S	T	A	N	D	A	R	D			C	O	N	F	I	G	.
C	O	N	F	I	R	M			-	>			O	K		

T	h	r	e	s	h	.			R	e	l	a	y		K	1
P	a	r	0	3		=			7	.	2	0	p	H		

Notes:

- ◆ If no key is pressed for a couple of minutes, the MCO14 automatically exits the configuration menu.
- ◆ Parameters that can be accessed from standard configuration mode, may vary depending on the instrument customization and settings of certain advanced parameters.
- ◆ The allowable values are limited by the processor, but it is recommended to always verify the congruence between the application and the set value.
- ◆ If a password has been entered, to access the configuration mode first type the correct password and then confirm with MENU/OK. When exiting the configuration mode, the access level returns to zero.
- ◆ All menus are "circular": scrolling with the arrow keys, when reaching the maximum, the minimum is then shown, and vice-versa.
- ◆ While configuration is in progress, the adjustment outputs (K1, K2, K4 and K5) are disabled. As the configuration menu is quitted, the processor recalculates their status and reactivates them.

CONFIGURATION PARAMETERS

The table here below provides the complete list of available configuration parameters. It is recommended to fill the last column with the values set for your application.



Warning! The complete list of parameters can be accessed only from the “Advanced Configuration” menu, while the “Standard Configuration” mode allows to modify only the parameters highlighted in bold in the table below.

Par.	Description	Min Value	Max Value	Factory Value	Set Value
P01	Measure linked to the relay K1 1 = M1 pH 2 = M2 Redox (ORP, mV) 3 = M3 (input not used) 4 = M4 Cl ₂ (Free chlorine, DPD) 5 = M5 °C (Temperature) 6 = M6 Cl _T (Total chlorine, DPD) 7 = M7 Cl _C (Combined chlorine, calculated)	1	7	1	
P02	Output type for relay K1 0 = disabled 1 = OnOff+ (closed upon threshold exceeded) 2 = OnOff- (open upon threshold exceeded) 3 = PWM+ (proportional adjustment) 4 = PWM- (proportional adjustment) 5 = Al. NO (alarm contact) 6 = Al. NC (alarm contact) 7 = PFM+ (pulse proportional adjustment) 8 = PFM- (pulse proportional adjustment) 9 = Timer (timed operation)	0	9	1	
P03	P02 = 1...4, 7...8 → Threshold K1 (value to reach) P02 = 5, 6 → Threshold K1 (alarm central value) P02 = 9 → (First) Activation time of relay K1	-1000	2000	7.20pH	
P04	P02 = 1...4, 7...8 → Hysteresis K1 P02 = 5, 6 → Hysteresis K1 (above and below the threshold) P02 = 9 → (First) Deactivation time of relay K1	0	500	0.20pH	
P05	P02 = 1, 2, 5, 6 → Activation delay for relay K1 P02 = 3, 4 → Time base PWM K1 P02 = 7, 8 → Not used P02 = 9 → (Second) Activation time of relay K1	0:00	30:00	00:10 min: sec	
P06	P02 = 1, 2, 5, 6 → Deactivation delay for relay K1 P02 = 3, 4, 7, 8 → Not used P02 = 9 → (Second) Deactivation time of relay K1	0:00	30:00	00:05 min: sec	
P07	Al. Max (Dosage) Time K1 (h: min)	0:00	09:59	02:00	
P08	OFF Condit. relay K1 Weight 1 = Lack of level 1 Weight 2 = Lack of level 2 Weight 4 = Lack of level 3 Weight 8 = UR / OR meas. associated to K1 Weight 16 = Alarm max. dosage time K1 Weight 32 = pH stability Weight 64 = Internal clock Weight 128 = Alarm zero chlorine or redox	0	255	95	
P09	Measure linked to the relay K2 1 = M1 pH 2 = M2 Redox (ORP, mV) 3 = M3 (input not used) 4 = M4 Cl ₂ (Free chlorine, DPD) 5 = M5 °C (Temperature) 6 = M6 Cl _T (Total chlorine, DPD) 7 = M7 Cl _C (Combined chlorine, calculated)	1	7	4	

Par.	Description		Min Value	Max Value	Factory Value	Set Value
P10	Output type for relay K2	0 = disabled 1 = OnOff+ (closed upon threshold exceeded) 2 = OnOff- (open upon threshold exceeded) 3 = PWM+ (proportional adjustment) 4 = PWM- (proportional adjustment) 5 = Al. NO (alarm contact) 6 = Al. NC (alarm contact) 7 = PFM+ (pulse proportional adjustment) 8 = PFM- (pulse proportional adjustment) 9 = Timer (timed operation)	0	9	4	
P11	P10 = 1...4, 7...8 → Threshold K2 (value to reach) P10 = 5, 6 → Threshold K2 (alarm central value) P10 = 9 → (First) Activation time of relay K2		-1000	2000	0.70ppm	
P12	P10 = 1...4, 7...8 → Hysteresis K2 P10 = 5, 6 → Hysteresis K2 (above and below the threshold) P10 = 9 → (First) Deactivation time of relay K2		0	500	0.20ppm	
P13	P10 = 1, 2, 5, 6 → Activation delay for relay K2 P10 = 3, 4 → Time base PWM K2 P10 = 7, 8 → Not used P10 = 9 → (Second) Activation time of relay K2		0:00	30:00	03:00 min: sec	
P14	P10 = 1, 2, 5, 6 → Deactivation delay for relay K2 P10 = 3, 4, 7, 8 → Not used P10 = 9 → (Second) Deactivation time of relay K2		0:00	30:00	00:00 min: sec	
P15	Al. Max (Dosage) Time K2 (h: min)		0:00	09:59	00:00	
P16	OFF Condit. relay K2	Weight 1 = Lack of level 1 Weight 2 = Lack of level 2 Weight 4 = Lack of level 3 Weight 8 = UR / OR meas. associated to K2 Weight 16 = Alarm max. dosage time K2 Weight 32 = pH stability Weight 64 = Internal clock Weight 128 = Alarm zero chlorine or redox	0	255	255	
P17	Input alarms on K3	Weight 1 = Lack of level 1 Weight 2 = Lack of level 2 Weight 4 = Lack of level 3 Weight 8 = Lack of Flow Weight 16 = No OFF consent	0	31	31	
P18	SW alarms on K3	Weight 1 = Start-up delay Weight 2 = pH stability Weight 4 = Internal clock Weight 8 = Alarm zero chlorine or redox	0	15	15	
P19	M1 alarms on K3	Weight 1 = UR / OR measure 1 (pH) Weight 2 = Alarm max. dosage time M1	0	3	3	
P20	M2 alarms on K3	Weight 1 = UR / OR measure 2 (RX) Weight 2 = alarm max. dosage time M2	0	3	3	
P21	M3 alarms on K3	Parameter not used	0	3	3	
P22	M4 alarms on K3	Weight 1 = UR / OR meas. 4 (ppm of free Cl ₂) Weight 2 = Alarm max. dosage time M4	0	3	3	
P23	M5 alarms on K3	Weight 1 = UR / OR measure 5 (°C) Weight 2 = Alarm max. dosage time M5	0	3	3	
P24	Relay K3	NO = 0 / NC = 1	0	1	1	

Par.	Description	Min Value	Max Value	Factory Value	Set Value
P25	Measure linked to the relay K4 1 = M1 pH 2 = M2 Redox (ORP, mV) 3 = M3 (input not used) 4 = M4 Cl ₂ (Free chlorine, DPD) 5 = M5 °C (Temperature) 6 = M6 Cl _T (Total chlorine, DPD) 7 = M7 Cl _C (Combined chlorine, calculated)	1	7	5	
P26	Output type for relay K4 0 = disabled 1 = OnOff+ (closed upon threshold exceeded) 2 = OnOff- (open upon threshold exceeded) 3 = PWM+ (proportional adjustment) 4 = PWM- (proportional adjustment) 5 = Al. NO (alarm contact) 6 = Al. NC (alarm contact) 7 = PFM+ (pulse proportional adjustment) 8 = PFM- (pulse proportional adjustment) 9 = Timer (timed operation)	0	9	2	
P27	P26 = 1...4, 7...8 → Threshold K4 (value to reach) P26 = 5, 6 → Threshold K4 (alarm central value) P26 = 9 → (First) Activation time of relay K4	0	2000	32.0 °C	
P28	P26 = 1...4, 7...8 → Hysteresis K4 P26 = 5, 6 → Hysteresis K4 (above and below the threshold) P26 = 9 → (First) Deactivation time of relay K4	0:00	500	1.0 °C	
P29	P26 = 1, 2, 5, 6 → Activation delay for relay K4 P26 = 3, 4 → Time base PWM K4 P26 = 7, 8 → Not used P26 = 9 → (Second) Activation time of relay K4	0:00	30:00	00:30 min: sec	
P30	P26 = 1, 2, 5, 6 → Deactivation delay for relay K4 P26 = 3, 4, 7, 8 → Not used P26 = 9 → (Second) Deactivation time of relay K4	0:00	30:00	00:20 min: sec	
P31	Al. Max (Dosage) Time K4 (h: min)	0:00	09:59	00:00	
P32	OFF Condit. relay K4 Weight 1 = Lack of level 1 Weight 2 = Lack of level 2 Weight 4 = Lack of level 3 Weight 8 = UR / OR meas. associated to K4 Weight 16 = Alarm max. dosage time K4 Weight 32 = pH stability Weight 64 = Internal clock Weight 128 = Alarm zero chlorine or redox	0	255	255	
P33	Measure linked to the relay K5 1 = M1 pH 2 = M2 Redox (ORP, mV) 3 = M3 (input not used) 4 = M4 Cl ₂ (Free chlorine, DPD) 5 = M5 °C (Temperature) 6 = M6 Cl _T (Total chlorine, DPD) 7 = M7 Cl _C (Combined chlorine, calculated)	1	7	4	
P34	Output type for relay K5 0 = disabled 1 = OnOff+ (closed upon threshold exceeded) 2 = OnOff- (open upon threshold exceeded) 3 = PWM+ (proportional adjustment) 4 = PWM- (proportional adjustment) 5 = Al. NO (alarm contact) 6 = Al. NC (alarm contact) 7 = PFM+ (pulse proportional adjustment) 8 = PFM- (pulse proportional adjustment) 9 = Timer (timed operation) 10 = Cyclic auto-cleaning 11 = Auto-cleaning synchronized with IMP	0	11	4	

Par.	Description		Min Value	Max Value	Factory Value	Set Value														
P35	P34 = 1...4, 7...8 → Threshold K5 (value to reach) P34 = 5, 6 → Threshold K5 (alarm central value) P34 = 9 → (First) Activation time of relay K5 P34 = 10, 11 → Not used		-1000	2000	0.70ppm															
P36	P34 = 1...4, 7...8 → Hysteresis K5 P34 = 5, 6 → Hysteresis K5 (above and below the threshold) P34 = 9 → (First) Deactivation time of relay K5 P34 = 10, 11 → Not used		0	500	0.20ppm															
P37	P34 = 1, 2, 5, 6 → Activation delay for relay K5 P34 = 3, 4 → Time base PWM K5 P34 = 7, 8, 11 → Not used P34 = 9 → (Second) Activation time of relay K5 P34 = 10 → Auto-clean pause K5 (pause between 2 cleaning cycles; h: min)		0:00	30:00	00:30 min: sec															
P38	P34 = 1, 2, 5, 6 → Deactivation delay for relay K5 P34 = 3, 4, 7, 8 → Not used P34 = 9 → (Second) Deactivation time of relay K5 P34 = 10, 11 → Auto-cleaning time K5		0:00	30:00	00:00 min: sec															
P39	Al. Max (Dosage) Time K4 (h: min) P34 = 10, 11 → Hold auto-clean K5 (Measure hold after cleaning; h: min)		0:00	09:59	00:00															
P40	OFF Condit. relay K5	Weight 1 = Lack of level 1 Weight 2 = Lack of level 2 Weight 4 = Lack of level 3 Weight 8 = UR / OR meas. associated to K5 Weight 16 = Alarm max. dosage time K5 Weight 32 = pH stability Weight 64 = Internal clock Weight 128 = Alarm zero chlorine or redox	0	255	255															
P41	Type of mA1 output	<table><tr><td>0 = 0/20 mA meas. 1</td><td>1 = 4/20 mA meas. 1</td></tr><tr><td>2 = 0/20 mA meas. 2</td><td>3 = 4/20 mA meas. 2</td></tr><tr><td>4 = 0/20 mA meas. 3</td><td>5 = 4/20 mA meas. 3</td></tr><tr><td>6 = 0/20 mA meas. 4</td><td>7 = 4/20 mA meas. 4</td></tr><tr><td>8 = 0/20 mA meas. 5</td><td>9 = 4/20 mA meas. 5</td></tr><tr><td>10= 0/20 mA meas. 6</td><td>11= 4/20 mA meas. 6</td></tr><tr><td>12= 0/20 mA meas. 7</td><td>13= 4/20 mA meas. 7</td></tr></table>	0 = 0/20 mA meas. 1	1 = 4/20 mA meas. 1	2 = 0/20 mA meas. 2	3 = 4/20 mA meas. 2	4 = 0/20 mA meas. 3	5 = 4/20 mA meas. 3	6 = 0/20 mA meas. 4	7 = 4/20 mA meas. 4	8 = 0/20 mA meas. 5	9 = 4/20 mA meas. 5	10= 0/20 mA meas. 6	11= 4/20 mA meas. 6	12= 0/20 mA meas. 7	13= 4/20 mA meas. 7	0	13	1	
0 = 0/20 mA meas. 1	1 = 4/20 mA meas. 1																			
2 = 0/20 mA meas. 2	3 = 4/20 mA meas. 2																			
4 = 0/20 mA meas. 3	5 = 4/20 mA meas. 3																			
6 = 0/20 mA meas. 4	7 = 4/20 mA meas. 4																			
8 = 0/20 mA meas. 5	9 = 4/20 mA meas. 5																			
10= 0/20 mA meas. 6	11= 4/20 mA meas. 6																			
12= 0/20 mA meas. 7	13= 4/20 mA meas. 7																			
P42	Starting value for mA1 output (0 or 4 mA)		-1000	2000	0.00pH															
P43	Full scale value for mA1 output (20 mA)		-1000	2000	14.00pH															
P44	OFF Condit. mA1 output	Weight 1 = Lack of level 1 Weight 2 = Lack of level 2 Weight 4 = Lack of level 3 Weight 8 = UR / OR meas. associated to mA1 Weight 32 = pH stability Weight 64 = Internal clock Weight 128 = Alarm zero chlorine or redox	0	255	72															
P45	Value upon error for mA1 output		0.00	21.00	2.00mA															
P46	Range of mA1 output (0 = 0...100%; 1 = -5...105%)		0	1	1															
P47	Type of mA2 output	<table><tr><td>0 = 0/20 mA meas. 1</td><td>1 = 4/20 mA meas. 1</td></tr><tr><td>2 = 0/20 mA meas. 2</td><td>3 = 4/20 mA meas. 2</td></tr><tr><td>4 = 0/20 mA meas. 3</td><td>5 = 4/20 mA meas. 3</td></tr><tr><td>6 = 0/20 mA meas. 4</td><td>7 = 4/20 mA meas. 4</td></tr><tr><td>8 = 0/20 mA meas. 5</td><td>9 = 4/20 mA meas. 5</td></tr><tr><td>10= 0/20 mA meas. 6</td><td>11= 4/20 mA meas. 6</td></tr><tr><td>12= 0/20 mA meas. 7</td><td>13= 4/20 mA meas. 7</td></tr></table>	0 = 0/20 mA meas. 1	1 = 4/20 mA meas. 1	2 = 0/20 mA meas. 2	3 = 4/20 mA meas. 2	4 = 0/20 mA meas. 3	5 = 4/20 mA meas. 3	6 = 0/20 mA meas. 4	7 = 4/20 mA meas. 4	8 = 0/20 mA meas. 5	9 = 4/20 mA meas. 5	10= 0/20 mA meas. 6	11= 4/20 mA meas. 6	12= 0/20 mA meas. 7	13= 4/20 mA meas. 7	0	13	7	
0 = 0/20 mA meas. 1	1 = 4/20 mA meas. 1																			
2 = 0/20 mA meas. 2	3 = 4/20 mA meas. 2																			
4 = 0/20 mA meas. 3	5 = 4/20 mA meas. 3																			
6 = 0/20 mA meas. 4	7 = 4/20 mA meas. 4																			
8 = 0/20 mA meas. 5	9 = 4/20 mA meas. 5																			
10= 0/20 mA meas. 6	11= 4/20 mA meas. 6																			
12= 0/20 mA meas. 7	13= 4/20 mA meas. 7																			
P48	Starting value for mA2 output (0 or 4 mA)		-1000	2000	0.00ppm															
P49	Full scale value for mA2 output (20 mA)		-1000	2000	5.00ppm															

Par.	Description			Min Value	Max Value	Factory Value	Set Value
P50	OFF Condit. mA2 output	Weight 1 = Lack of level 1 Weight 2 = Lack of level 2 Weight 4 = Lack of level 3 Weight 8 = UR / OR meas. associated to mA1 Weight 32 = pH stability Weight 64 = Internal clock Weight 128 = Alarm zero chlorine or redox		0	255	200	
P51	Value upon error for mA2 output			0.00	21.00	2.00mA	
P52	Range of mA2 output (0 = 0...100%; 1 = -5...105%)			0	1	1	
P53	Hold measurements with active IMP input			0	31	0	
P54	Start-up delay (min: sec)			00:10	59:59	00:20	
P55	Delay after restoring FLOW consent (min: sec)			00:00	59:59	00:05	
P56	Parameter not used			--	--	--	
P57 ... P70	Measurement activation / deactivation time on Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday			00:00	23:59	00:01 23:59	
P71	Parameter not used			--	--	--	
P72	Zero chlorine alarm			0.00	0.50	0.00ppm	
P73	Redox (ORP) alarm			0	1000	780mV	
P74	Visualization of colorimetric analysis cycle: 0 = none, 1 = Cl _{2F} value, 2 = Cl _{2T} value, 3 = Cl ₂ and Cl _T values			0	3	2	
P75	Pause between two colorimetric analysis cycles (min: sec)			00:20	15:00	05:00	
P76	Number of normal cycles per total/combined chlorine cycle			0	6	3	
P77	Working temperature			0	100	25°C	
P78	Super chlorination time (h: min)			00:00	24:00	12:	
P79	Box 1 display	1 = measure 1	11 = measure 1 + errors	1	19	1	
		2 = measure 2	12 = measure 2 + errors				
		3 = measure 3	13 = measure 3 + errors				
		4 = measure 4	14 = measure 4 + errors				
		5 = measure 5	15 = measure 5 + errors				
		6 = measure 6	16 = measure 6 + errors				
		7 = measure 7	17 = measure 7 + errors				
		8 = empty	18 = empty + errors				
		9 = ----	19 = --- + errors				
P80	Box 2 display	1 = measure 1	11 = measure 1 + errors	1	19	2	
		2 = measure 2	12 = measure 2 + errors				
		3 = measure 3	13 = measure 3 + errors				
		4 = measure 4	14 = measure 4 + errors				
		5 = measure 5	15 = measure 5 + errors				
		6 = measure 6	16 = measure 6 + errors				
		7 = measure 7	17 = measure 7 + errors				
		8 = empty	18 = empty + errors				
		9 = ----	19 = --- + errors				
P81	Box 3 display	1 = measure 1	11 = measure 1 + errors	1	19	3	4
		2 = measure 2	12 = measure 2 + errors				
		3 = measure 3	13 = measure 3 + errors				
		4 = measure 4	14 = measure 4 + errors				
		5 = measure 5	15 = measure 5 + errors				
		6 = measure 6	16 = measure 6 + errors				
		7 = measure 7	17 = measure 7 + errors				
		8 = empty	18 = empty + errors				
		9 = ----	19 = --- + errors				

Par.	Description		Min Value	Max Value	Factory Value	Set Value
P82	Box 4 display	1 = measure 1	11 = measure 1 + errors	1	19	15
		2 = measure 2	12 = measure 2 + errors			
		3 = measure 3	13 = measure 3 + errors			
		4 = measure 4	14 = measure 4 + errors			
		5 = measure 5	15 = measure 5 + errors			
		6 = measure 6	16 = measure 6 + errors			
		7 = measure 7	17 = measure 7 + errors			
		8 = empty	18 = empty + errors			
		9 = ----	19 = --- + errors			
P83	Display backlight	0 = LED power (no backlight control) 1 = backlight always ON 2..30 = minutes of backlight ON		0	30	3 min.
P84	Password for standard configuration		0	9999	0	
P85	Password for advanced configuration		0	9999	0	
P86	Deactivation of electrochemical calibrations		0	1	0	
P87	Delay of chlorine electrochemical calibration (minutes)		5	240	5	
P88	Reset of electrochemical calibrations		0	63	0	
P89	Language	0 = Italian / 1 = English / 2 = French / 3 = Spanish / 4 = Dutch		0	4	1
P90	Type of serial line	0 = reserved for µMMC 1, 2, 3 = ASCII 9600, 19200, 38400 BPS 4, 5, 6 = Modbus 9600, 19200, 38400 BPS		0	6	2
P91	Serial address		0	126	0	
P92	Summertime (0 = excluded; 1 = automatic change)		0	1	1	
P93	Data log	Off, 1...7 -> 1, 2, 5, 10, 15, 20, 30min		0	7	2 min.
P94	Autoset (factory settings)		0	999	0	

Notes:

- ◆ Some parameters have different meaning depending on the selected functioning of the relays; carefully read the related instructions.
- ◆ Depending on the instrument configuration, some parameters may be not displayed or be displayed as "not used".
- ◆ The parameter descriptions may vary depending on the software version and factory settings.

MEANING OF PARAMETERS

PARAMETER 01 MEASURE LINKED TO THE RELAY OUTPUT K1

This parameter associates a measure to relay K1; in other words, if you set P01=1, the measure 1 (standard pH) controls the relay K1. The values normally settable range from 1 to 5; in versions which also provide the calculated value of combined chlorine, valid values arrive up to 6.

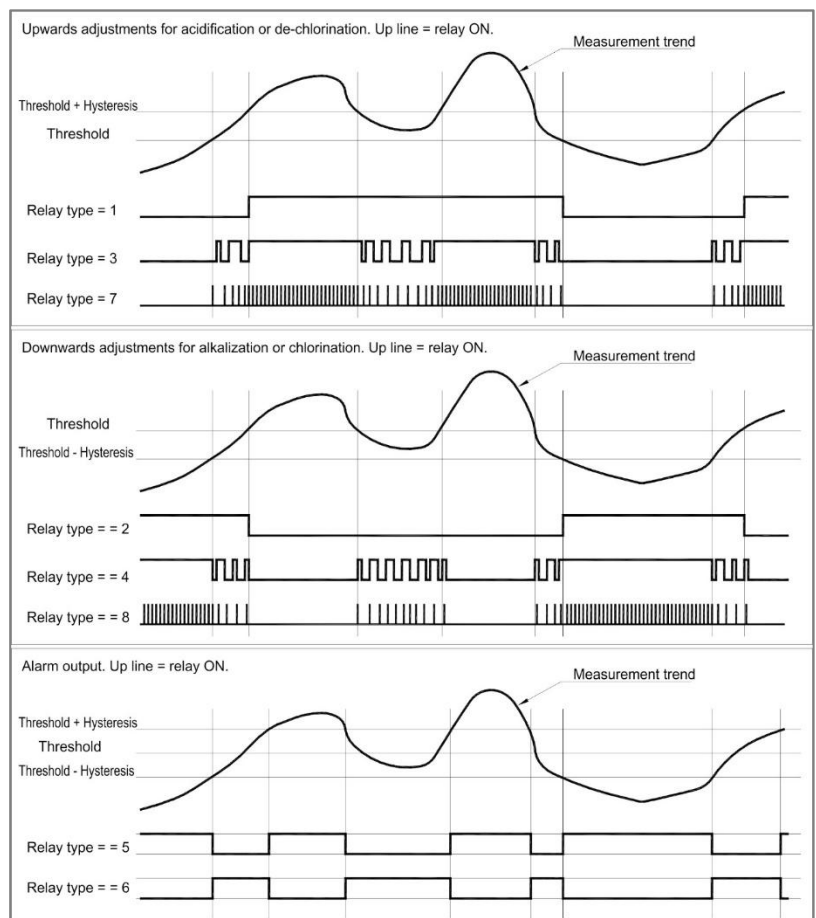
PARAMETER 02 OUTPUT TYPE FOR RELAY K1

The K1 output can operate in different modes, coded as follows:

0 = Disabled	The relay is not used
1 = OnOff+	On-Off control for acidification or de-chlorination
2 = OnOff-	On-Off control for alkalisation or chlorination
3 = PWM+	Time-based proportional control for acidification or de-chlorination
4 = PWM-	Time-based proportional control for alkalisation or chlorination
5 = Alarm NO	NO Relay contact → (alarm) when measure is outside set-point
6 = Alarm NC	NC Relay contact → closed (fail-safe) when measure is around set-point
7 = PFM +	Proportional control, pulse command, for acidification and de-chlorination
8 = PFM -	Proportional control, pulse command, for alkalisation or chlorination
9 = Timer	Timed operation. Relay activates / deactivates at scheduled times, not depending on measurement; this feature is useful, for example, to control pumps that dose additive products as flocculants or anti-algae

The diagrams are divided by type of adjustment, and the following can be noticed:

- 1) The adjustment changes depending on the type of operation set for the relay.
- 2) Up line = relay energized → closed contact.
Low line = relay not energized → open contact
- 3) In the terminal block are available only the NO contacts of the relay (or the voltage output); to get the inverse function just change the setting of the relative parameter (e.g. P02 1 → 2).



PARAMETER 03 ON-OFF / PWM / PFM OUPUT: THRESHOLD FOR RELAY K1
ALARM OUTPUT: ALARM THRESHOLD FOR K1
TIMER MODE: (FIRST) ACTIVATION TIME OF K1

- In case of adjustment relay, this parameter is the value to be reached.
- In case of alarm relay, this parameter is the central reference value for the alarm threshold.
- In case of timed operation, enter the hour of the first activation of the relay K1.

PARAMETER 04 ON-OFF / PWM / PFM OUPUT: HYSTERESIS FOR RELAY K1
ALARM OUTPUT: ALARM INTERVAL FOR K1
TIMER MODE: (FIRST) DEACTIVATION TIME OF K1

For setting the relay hysteresis, there are three cases:

- ON/OFF control: this parameter allows to set a “not intervention” window for the relay, typically to be set quite narrow (10... 20 points)
- Proportional control (PWM or PFM): this parameter allows to set the proportional adjustment band, typically set from 30 to 50 points
- Alarm output: this parameter is used to set the window (above and below the threshold), which defines if measurement is in alarm condition or not
- In case of relay configured for timed operation, enter the hour of the first deactivation of the relay. For proper operation, this value must be greater than that entered in parameter P03.

PARAMETER 05 ON-OFF / ALARM OUTPUT: ACTIVATION DELAY RELAY K1
PWM CONTROL: TIME BASE RELAY K1
PFM CONTROL: NOT USED
TIMER MODE: (SECOND) ACTIVATION TIME OF K1

- ON/OFF control: the intervention of the relay K1 with respect to the threshold exceeding, can be delayed of a certain time (min: sec), to be entered in this parameter. If P05=0, no delay is set.
- PWM proportional control: this parameter is the time base: the recommended values vary from approximately 10 seconds if the relay is used for activation or control of solenoid valves, up to 5...10 minutes if the relay is used for turning on / off dosing pumps.
- PFM control: this parameter is not used, and the output is fix between 0 and 180 pulses/min. In case of timed operation, enter the hour of the second activation of the relay. If a second daily activation of the relay is not required, set this parameter to zero.

PARAMETER 06 ON-OFF / ALARM OUTPUT: DEACTIVATION DELAY RELAY K1
PWM / PFM CONTROL: NOT USED
TIMED OPERATION: SECOND DEACTIVATION TIME OF K1

- ON/OFF control: the deactivation of the relay K1 with respect to the threshold, can be delayed of a certain time (in minutes: seconds), to be entered in this parameter. If P06=0, no delay is set.
- PWM proportional control: this parameter is not used.
- PFM control: this parameter is not used, and the output is fix between 0 and 120 pulses/min.
- In case of timed operation, enter the hour of the second deactivation of the relay. If the second activation is not required / used, enter zero. If it is used, for proper operation, it is necessary to enter a value greater than that set in P05.

PARAMETER 07 ALARM MAX DOSAGE TIME RELAY K1

This parameter allows to monitor the max dosage time (in hours: minutes).

When measurement leaves the set threshold and, therefore, the dosage is triggered, simultaneously starts this timer. If measurement returns to the threshold before the set time is elapsed, adjustment has been successful. If instead the threshold is not reached within the set time, an alarm is generated. This alarm can be only used as failure indication or stop of adjustment (see next parameter). Setting zero means that this alarm is not used.

Warning! The time base of this alarm is in minutes and, therefore, a delay of one minute for the alarm activation or deactivation can be expected!

PARAMETER 08 OFF STATUS RELAY K1

The K1 relay normally performs the adjustment set in P02 following the trend of the measurement set in P01. However, some alarm / fault conditions can be programmed to force the relay deactivation.

These conditions are:

Bit0	Weight 1	= lack of level 1
Bit1	Weight 2	= lack of level 2
Bit2	Weight 4	= lack of level 3
Bit3	Weight 8	= UR / OR for measure associated to relay K1
Bit4	Weight 16	= alarm max dosage time relay K1
Bit5	Weight 32	= pH stability
Bit6	Weight 64	= internal clock
Bit7	Weight 128	= alarm zero chlorine or alarm redox

Enter in this parameter the sum of the weights of the conditions to be enabled.

For example, for deactivating K1 (connected to the acid dosing pump) in case of measurement failure and internal clock error, set the value $8 + 64 = 72$. If you also want to consider the “alarm max dosage”, the value becomes $8 + 16 + 64 = 88$.

Warning! The lack of flow or the “system OFF” request also deactivate the output relays. These conditions are always active and cannot be disabled!

PARAMETER 09 MEASURE LINKED TO THE RELAY OUTPUT K2

As P01 but referred to relay K2.

PARAMETER 10 OUTPUT TYPE FOR RELAY K2

As P02 but referred to relay K2.

PARAMETERS 11 / 12 / 13 / 14 OPERATIONS OF RELAY K2

As P03 / P04 / P05 / P06 but referred to relay K2.

PARAMETER 15 ALARM MAX DOSAGE TIME RELAY K2

As P07 but referred to relay K2.

PARAMETER 16 OFF STATUS RELAY K2

As P08 but referred to relay K2.

PARAMETERS 17... 24

Relay K3 is only used for managing alarms. Usually, it is configured normally energized, so that it deactivates in case of alarm / fault. This operating mode is known as “fail-safe”.

These parameters allow to select (enable) the alarms to be detected on K3.

PARAMETER 17 ACTIVATION OF INPUT ALARMS ON RELAY K3

The inputs which may affect the relay K3 are:

Bit0	Weight 1	= lack of level 1
Bit1	Weight 2	= lack of level 2
Bit2	Weight 4	= lack of level 3
Bit3	Weight 8	= lack of flow
Bit4	Weight 16	= no OFF consent

Enter the sum of the weights of the alarms linked to the inputs to be enabled.

To enable all alarms (recommended), enter the value $1 + 2 + 4 + 8 + 16 = 31$.

PARAMETER 18 ACTIVATION OF SOFTWARE ALARMS ON RELAY K3

The software conditions which may affect the relay K3 are:

Bit0	Weight 1	= start-up delay
Bit1	Weight 2	= pH stability
Bit2	Weight 4	= internal clock
Bit3	Weight 8	= alarm zero chlorine or redox

Enter the sum of the weights of the alarms to be enabled. Often the start-up delay, “pH stability” error and stop from internal clock, are not considered errors; in this case, therefore, you should enter only the alarm “zero chlorine or redox”: $P18 = 8$.

PARAMETERS 19 ... 22 ACTIVATION OF MEASURE 1, 2, 3, 4 ALARMS ON RELAY K3

PARAMETER 23 ACTIVATION OF MEASURE 5 (temperature) ALARMS ON RELAY K3

For each measurement you can enable specific alarms, with the following weights:

Bit0 Weight 1 = UR / OR measure x

Bit1 Weight 2 = alarm max. dosage time for measure x

Usually, for the first four measures, both alarms are activated (i.e. P19...22 = 3), while P23 (temperature) is set to zero because often the temperature sensor is not used.

PARAMETER 24 RELAY K3 NO or NC

This parameter allows to set the desired configuration for relay K3:

P24 = 0 → K3 output normally open (NO), that closes upon alarm

P24 = 1 → K3 output normally excited (contact closed, NC), that opens upon alarm ("fail-safe" mode).

PARAMETER 25 MEASURE LINKED TO THE RELAY OUTPUT K4

As P01 but referred to relay K4.

PARAMETER 26 OUTPUT TYPE FOR RELAY K4

As P02 but referred to relay K4.

PARAMETERS 27 / 28 / 29 / 30 OPERATIONS OF RELAY K4

As P03 / P04 / P05 / P06 but referred to relay K4.

PARAMETER 31 ALARM MAX DOSAGE TIME RELAY K4

As P07 but referred to relay K4.

PARAMETER 32 OFF STATUS RELAY K4

As P08 but referred to relay K4.

PARAMETER 33 MEASURE LINKED TO THE RELAY OUTPUT K5

As P01 but referred to relay K5.

PARAMETER 34 OUTPUT TYPE FOR RELAY K5

This output can operate in the same modes of the other adjustment relays (K1, K2, K4), with two additional functions:

10 = automatic cleaning cycle.

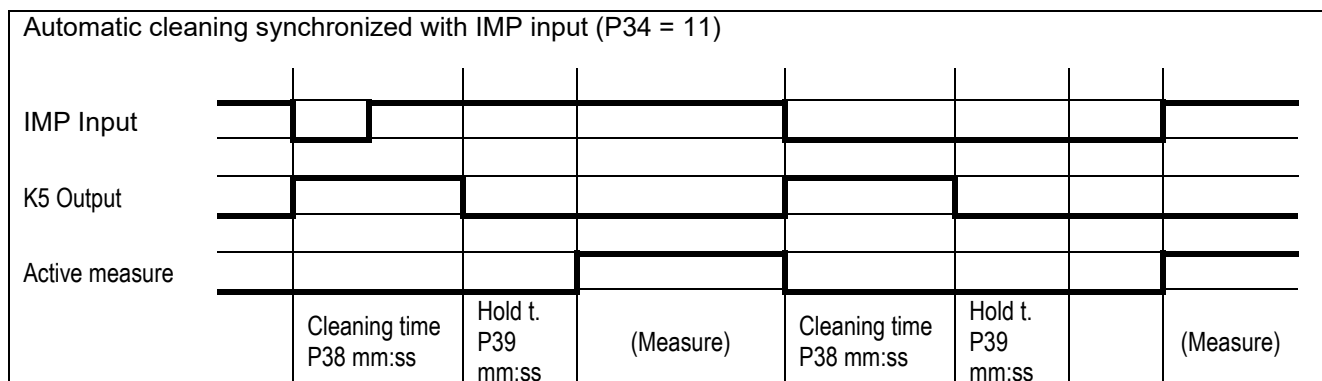
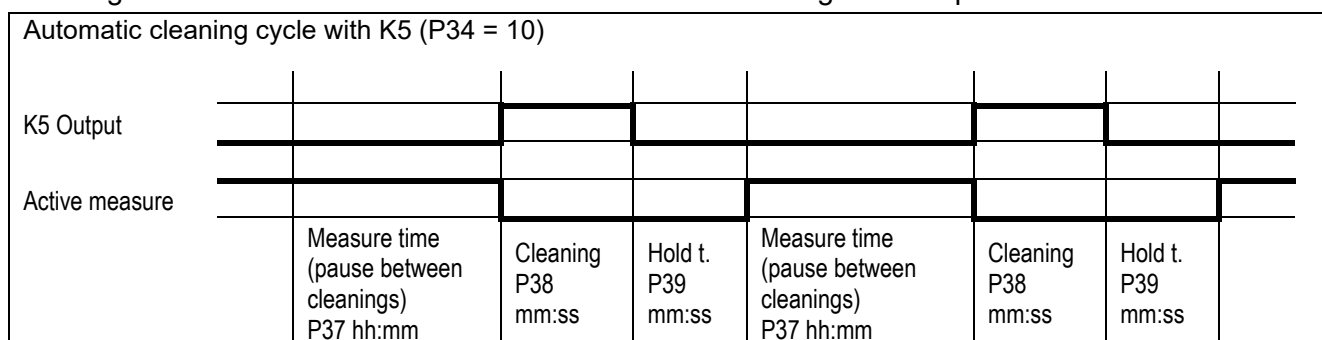
The relay connected to the sensor cleaning system activates for the time set in P38; during this time, the measurement(s) is(are) frozen to avoid variations due to the cleaning; then, measurement(s) is(are) hold for the hold time (P39). Finally, the P37 pause time (normal operation) is activated.

For selecting measurements to be frozen, see parameter P53.

11 = automatic cleaning synchronized with IMP input.

The functioning is the same explained here above for the automatic cleaning cycle, but the pause time (normal operation) is determined by the external signal to the IMP input (not by parameter P37). In this way, measurement is always active when the plant is working, and the sensor cleaning is performed when the system is in standby.

The diagrams here below show how the two automatic cleaning modes operate.



Note that the above diagrams are not to scale. As an indication, the cleaning time varies from 5 seconds to 1 minute, the measure hold time lasts approximately double the cleaning time, while the pause time (normal operation) varies from 1 to 6 hours, depending on the system, sensor type, degree of soiling, etc.
Warning! If K5 is configured for automatic cleaning cycle (P34 = 10), at start-up and each time the configuration mode is exited, after a fixed time of 10 seconds, a cleaning cycle is performed.

PARAMETERS 35 / 36 / 37 / 38 OPERATIONS OF RELAY K5

As P03 / P04 / P05 / P06 but referred to relay K5.

If P34 = 10 or 11, parameters P35 and P36 are not used.

If P34 = 10 or 11, for the correct setting of P37 and P38, also refer to explanations of P34 in case of automatic cleaning.

PARAMETER 39 ALARM MAX DOSAGE TIME RELAY K5

AUTOMATIC CLEANING: MEASURE HOLD DELAY AFTER CLEANING

As P07 but referred to relay K5.

If P34 = 10 or 11, for the correct setting, also refer to explanations of P34 in case of automatic cleaning.

PARAMETER 40 OFF STATUS RELAY K5

As P08 but referred to relay K5. Not used in case of automatic cleaning.

PARAMETER 41 TYPE OF CURRENT OUTPUT 1

14 different combinations are available:

0 = 0-20 mA measure 1	1 = 4-20 mA measure 1	(meas. 1 standard = pH)
2 = 0-20 mA measure 2	3 = 4-20 mA measure 2	(meas. 2 standard = ORP)
4 = 0-20 mA measure 3	5 = 4-20 mA measure 3	(meas. 3 standard = not available)
6 = 0-20 mA measure 4	7 = 4-20 mA measure 4	(meas. 4 standard = free chlorine)
8 = 0-20 mA measure 5	9 = 4-20 mA measure 5	(meas. 5 standard = temperature)
10 = 0-20 mA measure 6	11 = 4-20 mA measure 6	(meas. 6 standard = total chlorine)
12 = 0-20 mA measure 7	13 = 4-20 mA measure 7	(meas. 7 standard = combined chlorine)

Through the current output, measurement can be repeated remotely (for example, can be sent to an electrical panel or to a PC or PLC) or you can configure it for proportional adjustment.

PARAMETERS 42 / 43 STARTING / FULL SCALE VALUES FOR mA1 OUTPUT

These parameters allow to set the measurement values corresponding to the starting (0 or 4 mA depending on the P41 setting) and full scale (20 mA) values of the mA1 output.

For example, if measure 1 (pH) has been set and you want to have 4 mA at 3.50 pH and 20 mA at 8.40 pH, set P42 = 3.50 (of course with P41 = 1) and P43 = 8.40.

PARAMETER 44 OFF STATUS FOR mA1 OUTPUT

The mA output typically follows the measurement trend, depending on the setting of P42 and P43. Anyway, fault or alarm conditions can be generated, that force the output to a certain value, to be set in the parameter P45. These conditions are:

Bit0	Weight 1	= lack of level 1
Bit1	Weight 2	= lack of level 2
Bit2	Weight 4	= lack of level 3
Bit3	Weight 8	= UR / OR of measurement associated to mA1
Bit5	Weight 32	= pH stability
Bit6	Weight 64	= internal clock
Bit7	Weight 128	= alarm zero chlorine or alarm redox

Enter the sum of the weights of the conditions which force the output to the P45 value.

Warning! The lack of flow or the "system OFF" request also deactivate the mA outputs. These conditions are always active and cannot be disabled!

PARAMETER 45 mA UPON ERROR FOR mA1OUTPUT

If any error / fault defined in P44 occurs, the mA1 output will deliver the current set in this parameter. The value can be in the range from 0.00 to 21.00 mA. Typically, for a 4-20 mA output, set a fault current of 2 or 3 mA, so that any receiver can detect the problem, or a dosing pump stops.

PARAMETER 46 RANGE OF mA1 OUTPUT

The mA1 output can be 0-20 or 4-20 mA. If measurement exceeds the limits set in parameters P42 and P43, the value of the output current can stop at the minimum or maximum value, or slightly higher. In this way, any fault is signalled to the receiver.

For example: 4-20 mA output on measure 2 (P41 = 3), from 500 to 800 mV (P42 = 500, P43 = 800); if P46 = 0 and the reading falls to 480 mV (i.e. below the minimum), the current output will remain at 4.00 mA; if instead P46 = 1, the output current will be 3.00 mA. Similarly, with the reading at 803 mV (above the max) and P46 = 0, the output will be 20.00 mA, while with P46 = 1, the output will be 21.00 mA.

In case of 0-20 mA output, there will be an extended range for the output only for the 20-mA limit, because the MCO14 controller cannot generate a negative current.

PARAMETERS 47...52

As parameters P41...P46 but referred the mA2 output.

PARAMETER 53 HOLD MEASUREMENTS WITH ACTIVE "IMP" INPUT

This parameter allows to choose which measurements to freeze as the IMP input is activated and during the "hold" time of the automatic cleaning cycles. The last acquired values are frozen. Normal operations are resumed as the input is deactivated.

Bit0	Weight 1	= Hold measure 1
Bit1	Weight 2	= Hold measure 2
Bit2	Weight 4	= Hold measure 3
Bit3	Weight 8	= Hold measure 4
Bit4	Weight 16	= Hold measure 5

PARAMETER 54 START-UP DELAY

At start-up, some measurement sensors need a stabilization (or polarization) time, during which readings are not reliable. This parameter allows to set a proper start-up delay, in minutes: seconds.

Note that a pH electrode requires just one minute, while the stabilization of an ORP (redox) electrode may need up to 30 minutes. Sometimes this waiting time is also useful to compensate hydraulic delays at system start-up.

Then set a time that activates when the control unit is powered on, during which the outputs are disabled and the "PW mm:ss" message flashes on the display.

As this time elapses, the MCO14 unit begins normal operations.

PARAMETER 55 DELAY AFTER RESTORING THE FLOW CONSENT

When you restore a water flow that was interrupted, a sensor stabilization (or polarization) period may be necessary before the readings are again reliable. On average this time is shorter than the one set in P54. While the flow is lacking the outputs are disabled and remain disabled even after the flow has been restored, for the time set in this parameter.

P55=0 means to have a minimum delay of 2 seconds (factory setting).

PARAMETER 56 PARAMETER NOT USED

PARAMETERS 57, 58 MEASURE ACTIVATION / DEACTIVATION TIME ON MONDAY PARAMETERS 59...70 AS P57 & P58 FOR THE SIX REMAINING DAYS OF THE WEEK

MCO14 is equipped with an internal clock that allows to set in which time slots the outputs must be activated. These parameters are used for programming the switching on and off time for each day of the week. The values must be entered in the 24 hours format, from 00.00 to 23.59.

During the deactivation period, the display boxes configured for the visualization of error messages (see parameters P80...P83), will show the "TIME" message. This function is disabled by entering activation time 00.00 and deactivation time 23.59.

Typically, the activation time is before the switching-off (for example, activation at 07.00 and switching-off at 22.00), but you can also enter an activation time greater than the switching-off time, for example for swimming pools open till late night (for example, switching-off at 02.00 and reactivation at 08:00).

PARAMETER 71 PARAMETER NOT USED

Parameters reserved for future use.

PARAMETERS 72 / 73 ALARM ZERO CHLORINE / ALARM REDOX

These parameters allow to trigger an alarm when the chlorine signal becomes too low and disable the outputs upon alarm (see parameters P08, P16, P32, P40, P44, P50).

- **Alarm zero chlorine:** Knowing that the chlorine level in the plant / pool can never be lower than a certain value (for example 0.10 ppm of the replenishing water), if measurement is lower than this threshold (P73), the alarm is triggered.

- **Alarm redox:** Due to manual super chlorination or to dosage system faults, the ORP electrode may be not able to give a mV signal easily convertible into a ppm value. At normal chlorine concentration (0.80 to 1.20 ppm Cl₂), the electrode provides a signal of approximately 650-700 mV, that varies depending on the chemical conditions of the pool water; when saturated (chlorine level above 2.50-3.00 ppm), the electrode gives 720-740 mV. This characteristic can be used to disable the chlorine dosing system operation when ORP (redox) readings are too high. When the alarm condition is resolved, the ORP electrode returns to normal values and the controller resumes normal operation.

The redox alarm threshold (in mV) has to be set in the parameter P73, to be checked experimentally for each plant / pool.

Warning! The return of the RX electrode from saturation condition occurs with a delay of even 2 hours.

Setting P72 and P73 to zero means not activating these controls. If an alarm occurs, it is shown in the display boxes configured for the visualization of error messages (see parameters P80...P83), with the "0 Cl₂" and "REDOX" messages, respectively.

PARAMETER 74 VISUALIZATION OF COLORIMETRIC ANALYSIS CYCLE

The progress of the colorimetric analysis cycle can be displayed in the chlorine visualization boxes, alternating the analysis results. If this parameter is set to zero, nothing is displayed. If is set to 1, the visualization is in alternation with the free chlorine measurement; if is set to 2 the alternation is with the total chlorine; if is set to 3 the alternation is with both measurements.

PARAMETER 75 PAUSE BETWEEN TWO COLORIMETRIC ANALYSIS CYCLES

This parameter allows to enter a pause time between two subsequent colorimetric cycles for ppm Cl₂ reading (measure 4). This time is entered in minutes: seconds. Valid values go from 20 seconds to 15 minutes. Recommended values: 4...8 minutes.

PARAMETER 76 NUMBER OF NORMAL CYCLES PER TOTAL/COMBINED CHLORINE CYCLE

Normally the total chlorine monitoring does not require a high frequency as free chlorine. This parameter allows to set this frequency, as number of normal cycles (free chlorine analysis only) per complete cycle (free and total chlorine).

For example: 0 = never perform a complete cycle, 1 = each cycle is a complete cycle, 2 = one complete cycle every two analyses of free chlorine, etc.

Note: *The total/combined chlorine cycle lasts a quite long time. It is recommended to not perform this analysis too often to not reduce the frequency of free chlorine measurement and affect the mixer life.*

PARAMETER 77 WORKING TEMPERATURE

Usually, the working temperature is detected from the measure input 5 (PT100 probe). If no temperature sensor is connected, the value entered in this parameter is used as working temperature and reference for thermo-compensations.

PARAMETER 78 SUPER CHLORINATION TIME

This parameter is specific for pool applications. During super chlorination, the measurement sensors should not be touched by the water, to avoid unnecessary shock or oxidation. Since the super chlorination is a manual operation, before starting it, it is recommended to close the valves for water access to the system and reopen them only when a normal chlorine level has been restored.

Sometimes the super chlorination can be performed in a semi-manual way, without closing the water inflow to the sensors and activating the specific control function in the MCO14 unit.

Enter in parameter P78 a time (super chlorination time, in hours: minutes) during which the control unit does not activate any output. Once this time has elapsed, the unit resumes to normal operation. Minimum time = 0 (function disabled), maximum time = 24 hours.

To trigger this function, go to the main menu. During super chlorination, the display shows the countdown of the remaining time (hh:mm:ss). The displayed time can be increased or decreased by acting on the arrow keys (↑ ↓): each press results in a change of one minute.

In general, this parameter allows to set a time during which the outputs are disabled and, therefore, it can be also used for cleaning or maintenance operations, temporary closure of the plant, etc.

PARAMETERS 79 ... 82 BOX 1, BOX 2, BOX 3, BOX 4 DISPLAY

The display of the MCO14 unit is "divided" into four boxes of eight characters each, which normally show measurement values. Depending on the controller configuration, measures may be from two up to six. To choose what to display and in which order, each box is associated to a number between 1 and 6, depending on the desired measurement.

By entering the number of the measure to display +10, if any fault / alarm occurs, the box will show the measure alternating with a short error message (always in English).

Finally, by entering values other than the measure number, dashes or empty fields are displayed.

PARAMETER 83 DISPLAY BACKLIGHT

To save power and extend the display life, the backlight can be set to turn off when no key is pressed.

If this parameter is set to 1, the backlight is always on; values between 2 and 30 (minutes) indicate the lighting up time after the last key press.

The "zero" value is reserved for special versions, provided with a POWER LED for indicating normal operating mode (slow flashing) or alarm / error condition (fast flashing).

PARAMETER 84 PASSWORD FOR STANDARD CONFIGURATION

This parameter allows to lock the standard configuration menu. Set a value other than zero to prevent that unauthorized personnel can access the configuration mode. In this case, when you try to access the standard configuration, the unit will request this password. Only by entering the value set in this parameter, you can program the controller. When delivered, no password is set.

Warning! If you forget the set password, the configuration menu cannot be accessed, and you must send the instrument to the factory for unlocking.

PARAMETER 85 PASSWORD FOR ADVANCED CONFIGURATION

Same meaning and use of parameter P84 but referred to the advanced configuration.

PARAMETER 86 DEACTIVATION OF ELECTROCHEMICAL CALIBRATIONS

This parameter allows to inhibit all electrochemical calibrations of the unit, to prevent unqualified personnel from performing undesired calibrations. So, when an authorized technician wants to perform a calibration, he should first access the advanced configuration menu and set this parameter to zero (once completed the calibration, set back this parameter to 1). If the advanced configuration is password protected (P86), only authorized personnel can unlock the electrochemical calibrations.

PARAMETER 87 DELAY OF CHLORINE ELECTROCHEMICAL CALIBRATION

This parameter is used only for chlorine amperometric measurements. Not for this unit.

PARAMETER 88 RESET OF ELECTROCHEMICAL CALIBRATIONS

This parameter allows to restore the factory calibrations of the various measurement, at any time. It can be useful in case of calibrations performed not accurately or with wrong calibration solutions.

To reset the desired calibration, enter the corresponding code:

- P88 = 10 → reset all offset and gain values
- P88 = 11 → reset offset and gain for measure 1
- P88 = 12 → reset offset and gain for measure 2
- P88 = 13 → reset offset and gain for measure 3
- P88 = 14 → reset offset and gain for measure 4
- P88 = 15 → reset offset and gain for measure 5
- P88 = 16 → reset offset and gain for measure 6 (if provided)

Entering a value different from the ones listed will have no effect.

Warning! If a calibration cannot be completed successfully due to damaged sensor or wrong calibration solutions, it cannot be done even after the reset of the related offset and gain values!

PARAMETER 89 LANGUAGE

This parameter allows to choose the interface language. The available options are:

0 = Italian; 1 = English; 2 = French; 3 = Spanish; 4 = Dutch

PARAMETER 90 TYPE OF SERIAL LINE

From the hardware point of view, the serial output can be RS232 (standard) or RS485 (on request). This parameter allows to set the communication speed and the type of data processed, according to the following table:

P90	Speed [BPS]	Protocol / Intended use	P91 to associate
0		ASCII for μ MMC	0
1	9600	ASCII for RW14, closed source SW	0...9
2, 3	19200, 38400	ASCII for closed source SW	0...9
4, 5, 6	9600, 19200, 38400	Modbus RTU Protocol	1...126

PARAMETER 91 SERIAL ADDRESS

In case of RS232 hardware, this value is always zero, as communication is only between the supervisor (PC, RW14, μ MMC) and the control unit. Instead, in case of multipoint communication, i.e. RS485 serial port, you must enter the specific address to which the control unit will respond.

In the case of ASCII communication without protocol, the allowed values range from 1 to 9 (then converted to the characters "a" ... "i"), while for the Modbus protocol, addresses 1 to 126 are provided.

Note: In case of connection to RW14 or μ MMC, this parameter must be set to zero.

PARAMETER 92 SUMMERTIME

The internal clock can automatically change from standard to summertime (and vice versa), accordingly with the UE directives.

P92 = 0 → function disabled; P92 = 1 → function active.

Warning! *This function will work till the year 2040.*

PARAMETER 93 DATA LOGGER

The MCO14 unit is equipped with an auxiliary internal memory, separate from the one used for saving calibration and configuration data, only to store the measurement values. This memory has a limited space, enough for 4080 recordings. Once reached the 4080 recordings, the new values are overwritten in the oldest ones. This feature is useful in the first days of plant start-up, to check the proper performance of measurements and suitable dimension the dosages (for example, if the dosage is too strong, you will notice a saw tooth trend of the measurement). If the system is sufficiently monitored, the data can be downloaded with an appropriate frequency. In fact, using the appropriate serial command (512), all the 4080 data are downloaded in an intuitive format, easily importable into Excel (or similar programs), for creating tables and graphs. With standard communication rate (9600BPS) the data downloading will take approximately 7 minutes (time that is halved in the case of speed 19200BPS and is reduced to a quarter at 38400BPS). During this phase, the unit operates normally, but you cannot access any visualization. You can also use the command 511 to view the last storage, or the command 513 to display the last 50 measurements.

This parameter allows to set the recording sequence as follows:

- 0 = no recording
- 1 = recording every minute, duration of about three days
- 2 = recording every 2 minutes, duration of about six days
- 3 = recording every 5 minutes, duration of about 14 days
- 4 = recording every 10 minutes, duration of about 28 days
- 5 = recording every 15 minutes, duration of about 42 days
- 6 = recording every 20 minutes, duration of about 56 days
- 7 = recording every 30 minutes, duration of about 85 days

A second part of the memory is reserved for storing the events, complete with date and time. Also in this case the maximum number of records is 4080. The short commands for event identification are always in English. The commands to view the content of this part of memory are: 514 = last event, 515 = all events, 516 = last 50 events.



Note: *The memory life is at least three years with recordings every minute, 6 years with recordings every 2 minutes, and so on.*

PARAMETER 94 AUTOSET

This parameter allows to restore the factory settings for all configuration parameters and resets all offset and gain values of measurements; it is, therefore, a function to be used **only in case of malfunctioning** due to wrong calibrations, or to **completely reset** the controller to move it to a new plant.

The function is activated by entering:

- P94 = 1 → specific values for the pH/RX/CL2/CLT configuration

Moreover, different values can be agreed with the customer for specific restoring.

Warning! *If special functions have been activated in your device, restoring the factory configuration will make you lose those settings.*

Parameter P89 (Language) will not be affected.

CONTROL EXAMPLES

Here are some examples for configuring the control parameters:

1) Acidification control with the pH-meter section, to keep the pH value at 7.40:

1a) Simple ON/OFF control on K1:

MEASURE LINKED (M1 pH)	(P01 = 1)
RELAY TYPE (ON/OFF acidification)	(P02 = 0)
THRESHOLD (7.30 pH)	(P03 = 7.30)

It is recommended to set a narrow hysteresis window:

HYSTERESIS (0.20 pH)	(P04 = 0.20)
No delay is requested. Set:	
ACTIVATION DELAY	(P05 = 0:00)
DEACTIVATION DELAY	(P06 = 0:00)

1b) PWM proportional control on K1:

MEASURE LINKED (M1 pH)	(P01 = 1)
RELAY TYPE (PWM acidification)	(P02 = 3)
THRESHOLD (7.30 pH)	(P03 = 7.30)

The start / end control window (proportional band) should not be too narrow to avoid instability problems. Set:

HYSTERESIS (0.50 pH)	(P04 = 0.50)
The time base must be set depending on the actuator type (solenoid valves: 10...20 sec, small dosing pumps: 2...3 minutes; bigger pumps: at least 5 minutes):	
TIME BASE (3 min)	(P05 = 3:00) / (P06 = 0:00)

The following parameters must also be set:

P07 = Alarm max dosage time for K1 → depends on the chemical / hydraulic reaction time; typically, within one hour from the dosage start, the threshold must be reached → P07 = 1:00.
P08 = OFF K1 → K1 can be disabled upon measurement error, alarm max dosage time and internal clock: enter the sum of the weights → $P08 = 8 + 16 + 64 = 88$

2) Control of the pool chlorination to get a free chlorine level of 0.80 ppm

2a) Simple ON/OFF control on K2:

MEASURE LINKED (M4 Cl ₂)	(P09 = 4)
RELAY TYPE (ON/OFF chlorination)	(P10 = 2)
THRESHOLD (0.80 ppm)	(P11 = 0.80)
HYSTERESIS (0.15 ppm)	(P12 = 0.15)
ACTIVATION DELAY	(P13 = 0:00)
DEACTIVATION DELAY	(P14 = 0:00)

2b) PWM proportional control on K2:

MEASURE LINKED (M4 Cl ₂)	(P09 = 4)
RELAY TYPE (PWM chlorination)	(P10 = 4)
THRESHOLD (0.80 ppm)	(P11 = 0.80)
HYSTERESIS (0.40 ppm)	(P12 = 0.40)
TIME BASE (3 minutes)	(P13 = 3:00) / (P14 = 0:00)

As for the previous example, the following parameters must also be set:

P15 = Alarm max dosage time for K2 → consider a maximum of one hour and a half to reach the threshold, then set P15 = 1:30.
P16 = OFF K2 → K2 can be disabled upon measurement error, alarm max dosage time, "pH stability" time, internal clock and zero chlorine or redox alarm: enter the sum of the weights → $P16 = 8 + 16 + 32 + 64 + 128 = 248$

- 3) Adjust the water temperature to get a heating up to 28.0 °C:
- 3a) Simple ON/OFF control on K4:
- | | |
|---|--------------|
| MEASURE LINKED (M5 temperature) | (P25 = 5) |
| RELAY TYPE (open if threshold exceeded) | (P26 = 2) |
| THRESHOLD (28.0 °C) | (P27 = 28.0) |
| HYSTERESIS (0.4 °C) | (P28 = 0.4) |
| ACTIVATION DELAY | (P29 = 0:00) |
| DEACTIVATION DELAY | (P30 = 0:00) |
| AL. MAX TIME K4 (no limits) | (P31 = 0:00) |
| OFF COND. K4 (K4 can be disabled only upon measurement error, then set only the weight 8) | (P32 = 8) |
- 4) Check the pool chlorination to have 1 ppm of free, using the K4 output configured as SSR relay and pump with pulse input:
- | | |
|--------------------------------------|--------------|
| MEASURE LINKED (M4 Cl ₂) | (P25 = 4) |
| RELAY TYPE (PFM, chlorination) | (P26 = 12) |
| THRESHOLD (1.00 ppm) | (P27 = 1.00) |
| HYSTERESIS (0.30 ppm) | (P28 = 0.30) |
- 5) Activate timed operation on K5 to control the pump for dosing flocculent.
Suppose we need to set a single daily dosage of flocculent at 06:00, for a period of 15 minutes.
- | | |
|---|---------------|
| MEASURE LINKED (M1 pH, not relevant) | (P33 = 1) |
| RELAY TYPE (timed operation) | (P34 = 11) |
| (FIRST) ACTIVATION TIME | (P35 = 06:00) |
| (FIRST) DEACTIVATION TIME | (P36 = 06:15) |
| (SECOND) ACTIVATION TIME | (P37 = 00:00) |
| (SECOND) DEACTIVATION TIME | (P38 = 00:00) |
| AL. MAX TIME K5 (not applicable) | (P39 = 0:00) |
| OFF COND. K5 (K5 is automatically disabled in case of lack of flow or no external consent, so for this setting, this parameter can remain zero) | (P40 = 0) |
- Important!** In this case the K5 output must be configured as a simple contact and enters as an external consent signal in the pump for flocculent dosing; it must not interrupt the power supply, since K5 cannot be used at 230V~.
- 6) **Adjust the combined chlorine (chloramine) concentration using an UV system:**
- 6a) Proportional control through mA2 output and UV system with 4-20 mA input for the proportional modulation of the radiation:
- | | |
|--------------------------------------|--------------|
| OUTPUT TYPE mA2 (4-20 mA for meas.7) | (P47 = 13) |
| START VALUE FOR mA2 (0.10 ppm) | (P48 = 0.10) |
| FULL RANGE OF mA2 (1 ppm) | (P49 = 1.00) |
| OFF COND. FOR mA2 | (P50 = 234) |
| mA2 VALUE UPON ERROR (2 mA) | (P51 = 2.00) |
| RANGE OF mA2 OUTPUT (5...105%) | (P52 = 1) |
- 6b) Regolazione On-Off attraverso uscita relè K5 e sistema UV con ingresso a contatto per l'attivazione / disattivazione del ballast della lampada:
- | | |
|---------------------------------------|------------------------------|
| MEASURE LINKED (M7 combined chlorine) | (P33 = 7) |
| RELAY TYPE (OnOff+) | (P34 = 1) |
| THRESHOLD (0.2 ppm) | (P35 = 0.2 Cl _c) |
| HYSTERESIS (0.1 ppm) | (P36 = 0.1 Cl _c) |
| ACTIVATION DELAY | (P37 = 00:00) |
| DEACTIVATION DELAY | (P38 = 00:00) |
| AL. MAX TIME K5 | (P39 = 00:00) |
| OFF COND. K5 | (P40 = 255) |

ELECTROCHEMICAL CALIBRATIONS

pH

Preparation:

- Check availability and expiration date of the calibration solutions, buffers at pH 7 and pH 4 (or 9)
- Check the buffer solution temperature (if the temperature is significantly different from the working temperature, use the immerse the temperature compensation sensor into the buffer together with the electrode; wait about 3 minutes for thermal equilibrium)
- Simulate the OFF contact or close the water inlet valve to activate the “flow” alarm and, therefore, disable all outputs during calibration

Calibration procedure:

- Remove the electrode from its support, rinse it with distilled water, then dry it
- Immerse the electrode into the pH 7.01 buffer solution
- Press the MENU/OK key
- The instrument ask confirmation to enter the calibration mode: press ESC to exit the calibration mode, or MENU/OK to confirm.
If calibration option is confirmed, the display shows two choices:
- Press ↓ to calibrate the offset (pH 7.01); the instrument automatically recognizes and displays the buffer value
- If necessary, use the arrow (↑ ↓) keys to adjust the calibration value
- Press MENU/OK to confirm the calibration, or ESC to exit without saving (and the previous calibration data are kept)
- Rinse the electrode with distilled water, then dry it
- Immerse the electrode into the pH 4.01 (or 9.01) buffer solution
- Repeat steps from 4 to 8, pressing the ↑ key at step 7 to select the gain calibration
- Install back the pH electrode and Pt100 probe (if used) for normal control operations
- Open water flow to the system, remove the OFF contact to resume to normal operations

	C	a	l	i	b	r	.		M	1		p	H		
	C	o	n	f	i	r	m		-	>		O	K		

	C	a	l	i	b	r	.		M	1		p	H		
↓		O	f	f	s	e	t		↑		G	a	i	n	

	C	a	l	i	b	r	.		O	f	f	s	e	t	
M	e	a	s	.	1				7	.	0	1	p	H	

If you try to calibrate the gain at pH lower than 4 or higher than 9, the unit will provide the input value as calibration point (no automatic recognition). If the input value is not compatible with the calibration (too far from the correct values), for both the offset and gain, the instrument automatically discards the calibration and generate an error. The display shows the message “Calibration failed!”

Possible causes:

- wrong sequence of keystrokes during the procedure
- the buffer solution is contaminated or expired
- the electrode is not working properly (damaged or exhausted)
- the connection cable is damaged

ORP

Preparation:

- a) Check availability and expiration date of the calibration solution (e.g. 220 mV)
- b) Simulate the OFF contact or close the water inlet valve to activate the “flow” alarm and, therefore, disable all outputs during calibration

Calibration procedure:

- 1) Remove the electrode from its support, rinse it with distilled water, then dry it
- 2) Immerse the electrode into the calibration solution (e.g. 220 mV)
- 3) Press the MENU/OK key
- 4) Press $\uparrow$ until the display shows the message “CALIBRATION M2 mV”
- 5) Press $\downarrow$ to perform the offset calibration
- 6) The instrument automatically recognizes and displays the solution value
(**Note:** *The unit automatically recognizes the standard solutions at 220mV, 468mV and 650mV*)
- 7) If necessary, use the arrow ($\uparrow \downarrow$) keys to adjust the calibration value
- 8) Press MENU/OK to confirm the calibration, or ESC to exit without saving (and the previous calibration data are kept)
- 9) Rinse the electrode with distilled water, then dry it
- 10) Carefully install back the electrode for normal control operations
- 11) Open water flow to the system, remove the OFF contact to resume to normal operations

The ORP calibration is a single-point procedure (offset).

If you try to perform a ORP calibration with an offset value other than those recognized automatically by the instrument, the display shows the input value as calibration point (no automatic recognition).

If the “Calibration failed!” error message is displayed, the possible causes are:

- a) the calibration solution is contaminated or expired
- b) the electrode is not working properly (damaged or exhausted)
- c) the connection cable is damaged

Colorimeter

We do not recommend any adjustment of this section. In fact, the colorimeter is factory calibrated with a reference colorimeter. If you would still like to make minor adjustments of the indicated measurement, proceed as follows:

- 1) Press the MENU/OK key
- 2) Press $\uparrow$ until the display shows the message “CALIBRATION M4 Cl2”
- 3) Press $\uparrow$ to perform the gain calibration
- 4) The display will show the chlorine value currently stored
- 5) Use the arrow ($\uparrow \downarrow$) keys to adjust the displayed value to the desired value
- 6) Press MENU/OK to confirm the calibration, or ESC to exit without saving (and the previous calibration data are kept)

If measurement is wrong or too low (below 0.50 ppm), calibration cannot be performed.

If the unit can also measure total chlorine, the adjustment can be performed by displaying the option “Calibration CLT”.

Temperature

The instrument electronic calibration and the precision class of the Pt100 sensor, ensure a maximum error of $\pm 0.3^{\circ}\text{C}$ @ 0°C and $\pm 0.8^{\circ}\text{C}$ @ 100°C (Pt100: class B accordingly with IEC 751). This error is acceptable for most applications, and no temperature calibration is required.

ADDITIONAL VISUALISATIONS

Pressing the arrow keys ($\uparrow$ $\downarrow$) while in normal mode, specific visualizations of the parameters related to the measurements, are displayed. The value within brackets is the input value before being converted, the “G” value is the gain factor, the “O” is the offset.

pH	(mV value without temperature compensation) G = 0.750 ... 1.500 / O (offset a 25°C) = -0.90 ... 0.90
ORP (Redox)	(mV value with no offset added) G = fixed multiplication factor (1.000) / O = offset in mV (-100 ... 100)
Temperature	(value without offset/gain) G = 0.940 ... 1.060 / O (offset in °C) = -2.0 ... 2.0
Colorimetric analysis	(transmittance value without offset/gain) G = 0.700 ... 1.300 / K (self-zeroing offset) = 0.900 ... 3.000

In general, the more the offset value is close to zero and the more the gain value is close to 1.000, the better are better are the sensor conditions.

SET DATE / TIME

Press the MENU/OK key and use the $\downarrow$ $\uparrow$ keys to access the set date/time procedure.

Press MENU/OK to confirm.

The display shows date and time, with the cursor under the name of the day.

Use the $\downarrow$ $\uparrow$ keys to set the day and then press MENU/OK to confirm, or ESC to exit without saving.

After confirming the setting, the cursor moves to the next field. Proceed to the adjustment of all available fields.

	S	e	t		d	a	t	e	/	t	i	m	e		
	C	o	n	f	i	r	m		-	>		O	K		

	T	h	u	.		2	1		M	a	y		2	0	1	5
					0	9	:	4	9	:	3	1				

MANUAL OPERATIONS

The controller allows to perform some manual testing operations.

To enter this mode, press MENU/OK once and then press the $\downarrow$ $\uparrow$ keys until the “Test outputs” message is displayed.

Press MENU/OK to access the mode.

The unit displays the first available test, referred to the K1. Use the $\downarrow$ $\uparrow$ keys to scroll the tests of the remaining relays and specific functions/parts for colorimetric analyses.

Press MENU/OK to confirm the desired option.

	T	e	s	t		o	u	t		p	u	t	s			
	C	o	n	f	i	r	m		-	>		O	K			

	T	e	s	t		o	u	t		p	u	t	s			
	R	e	i	a	y		K	1				O	F	F		

Please note that:

- K1, K2, K4, K5 are the four control relays; the manual activation of these relays can be useful to check the devices connected to them
- K3 is the alarm relay
- K6, K7, K8, K9, K10 and K11 are the (internal) outputs specific for the colorimeter, and activate EV (solenoid valve), P1 (pump 1), P2 (pump 2), P3 (pump 3), Mix1 (mixer 1) and Mix2 (mixer 2), respectively

To exit the “Test outputs” mode, press ESC.

Warning! The “Test outputs” menu cannot be accessed while a colorimetric analysis is in progress! The relay energization can cause dangerous activations of the device connected to it.

ERRORS

When an error occurs, the display shows a specific error code and a short description. Generally, the errors appear when the unit is powered on or when exiting the configuration mode. The error display is shown for about 3 seconds. The possible errors are listed here below:

ERR 11 Calculation mA1 output

The start / full scale values for mA1 output range are too close. Check P42 and P43.

ERR 12 Calculation mA2 output

The start / full scale values for mA2 output range are too close. Check P48 and P49.

ERR 13 Calculation PWM or PFM relay K1

The relay K1 has been configured for proportional control (PWM with P02 = 3 or 4, or PFM with P02 = 7 or 8), but the hysteresis window (proportional band) is too narrow, or the time base has been set to zero. Check the setting of P04 and P05.

ERR 14 Calculation PWM or PFM relay K2

As error 13 but referred to K2. Check the setting of P12 and P13.

ERR 15 Calculation PWM or PFM relay K4

As error 13 but referred to K4. Check the setting of P28 and P29.

ERR 16 Calculation PWM or PFM relay K5

As error 13 but referred to K5. Check the setting of P36 and P37.

ADDITIONAL ALARM MESSAGES

In case of input signals too low or too high, the unit displays the messages “**UR**” (Under Range) or “**OR**” (Over Range). In fact, in these conditions the value of the input signal is not reliable, and an error is generated.

During the colorimetric reading cycle, the control unit performs an auto-reset cycle to compensate for water turbidity, dirty lenses and other possible interferences. If the result is not satisfactory, an error is generated and signalled by the message “**No Azz**”.

The boxes reserved to the error visualization may also display the following messages:

PW mm:ss	indicates the countdown of the start-up delay before starting normal operation
pH mm:ss	indicates the countdown of the “pH stability” waiting time before starting normal operation
Off	indicates the request of disabling outputs from the OFF contact
Flow	indicates the lack of flow detected by the FLW contact
Time	indicates the request of disabling outputs from internal clock
0 Cl₂	indicates “alarm zero chlorine”
Redox	indicates “alarm redox”
Max TK1	indicates “alarm max dosage time K1”
Max TK2	indicates “alarm max dosage time K2”
Max TK4	indicates “alarm max dosage time K4”
Max TK5	indicates “alarm max dosage time K5”
Lev 1 / Lev 2 / Lev 3	indicate respectively the lack of reagent 1 / 2 / 3

Instrument block -> memory reset

if the microcontroller finds non-congruent data in the memory and cannot fix them, it blocks the operations of the control unit and generate this alarm. This is an error that occurs very rarely and that may be due only to a memory defect or to noise so strong as to overcome the filters of the power supply and inputs. Return the instrument to the manufacturer for replacing the microcontroller.



Only for skilled personnel! A limit working time can be set, after which the control unit requests a technical assistance intervention. This warning does not block the system operation but serves to schedule the maintenance by an authorized technician. This time is entered via serial line (ASCII code, no ModBus) with the command **AL=dd**, where “dd” are the days of autonomy. Once maintenance has been performed, clear the warning message with the serial command **AZ**.

SERIAL LINE

MCO14 features a serial line (RS232C or RS485) for communication with terminals, PC or advanced PLC. Please note that the supervisor connected to the MCO14 control unit is named "Master". Considering a hypothetical link between MCO14 and PC, on which runs a "HYPERTERMINAL" program or equivalent, what appears on the "Master" video is exactly the answer of the MCO14.

Whatever the speed set with parameter P89, the standard transceiver parameters are:

8 BITS, NO PARITY, 1 STOP BIT.

Different characteristics can be requested upon order. The pin-out on the terminal block are described in the "Electrical Connections" section.

Communication can be of **ASCII** type without protocol or with **Modbus RTU** protocol.

ASCII

In case of no protocol, communication takes place using ASCII standard characters, without control character. Messages sent over the serial line have been designed to be as simple and intuitive as possible.

For the connection of the serial line terminal block, see the "Electrical Connection" section.

MCO14 automatically sends to the "Master" the following messages:

MCO14 START-UP	at start-up
ERROR PARAMETER nn	at start-up or when exiting the configuration mode
LOW POWER SUPPLY	at start-up or when detecting low power supply

MCO14 answers to the following commands:

Command	Effect	Command	Effect
M1	Show measure 1 value	DD	Show date/time
M2	Show measure 2 value	Pxxx	Read PARAMETER xxx value
M3	Show measure 3 value	Pxxx = YYYY	Write the value YYYY in parameter xxx
M4	Show measure 4 value	AP	Update parameters (required after each setting change)
M5	Show measure 5 value	511	Last record of the data logger
M6	Show measure 6 value (if provided)	512	Send data stored by the data logger
M7	Show measure 7 value (if provided)	513	Send last 50 data stored by the data logger
M8	Show electronic board temperature	514	Last event recorded in the data logger
HH	Help dei comandi	515	Send events stored by the data logger
UU	Values of mA1 and mA2 outputs	516	Send last 50 events stored by the data logger
SS	Status of inputs, outputs, alarms	AL=gg	Time limit (in days) for service request
RR	Microprocessor reset (reboot)	AZ	Cancel the service request alert
		ZZ	Reset offset/gain values

Notes:

- In case of RS485 serial line, these commands (and their answers) are preceded by the unit address, set in parameter P89, which is a lowercase letter starting from "a" (i.e. from "a" to "i" for address from 1 to 9).
- There are also other adjustment / calibration commands used only at the factory.
- Each command must be confirmed by pressing <CR> (or <ENTER>).
- All serial line messages are fixed and are not affected by the language set for the display.
- Typing mistakes in a command cannot be corrected. Send the wrong command (which will have no effect) and then enter the correct one.

Configuration through Serial Line (for technical personnel)

This section describes the configuration procedure from RS232C (serial line):

- 1) Connect the supervisor (for ex. a PC) to the terminal block of the serial line, while paying attention to the serial port type (RS232 or RS485)
- 2) To the command **Pxx (CR)** sent by the supervisor, the MCO14 unit answers with the "xx" parameter value
- 3) If the supervisor command is instead **Pxx=1234 (CR)**, the unit interprets the four digits following the "=" sign as the new value of the parameter

Notes:

- ◆ All values are without comma. For example, if P03 is set at 7.20pH (K1 threshold), it will be read as **0720**; on the other hand, for setting P03 to 7.30pH, the command will be **P03=0730 (CR)**
- ◆ The MCO14 unit stores the value without any control; it is up to the supervisor to check the limits
- ◆ The commands from the serial line can be both uppercase and lowercase
- ◆ The "cancel" command is not active; if you type a wrong datum, you must rewrite it
- ◆ In the case of RS485 serial line, the **serial address** must be added to the commands, in the form of lowercase letter, starting from "a"

In the data logger measurements are stored in fixed format, such as:

150418;15.20;+007.00;-00084.;+000.00;+001.32;+0025.7;+000.00

Which correspond to:

YearMonthDay;Hours.Minutes;Measure1;Measure2;Measure3;Measure4;Measure5

The events are stored as short, simple messages in English, which also include the date and time indication:

Event	Description	Event	Description
Power On	Device switching on	Offs Mx	Offset calibration of measure "x"
Std Editor	Standard parameter editor	Gain Mx	Gain calibration of measure "x"
Adv Editor	Advanced parameter editor	Tar.Disab.	Attempted unauthorized calibration
Test Out	Manual test of outputs	Wait Tar.	Attempt to calibrate prematurely
Set Time	Clock adjustment	Err.Tar.Mx	Calibration error of measure "x"
Serial Edit	Parameter editing from serial line	End Tar.	Successful calibration
TMx=yy	Factory calibrations / settings	Err. yy	Error "yy" (see "Errors" for details)
UMx=yy		MaxTKx=s	Error max dosage time for relay "x"
VMx=yy		TimeOff=s	Device OFF requested from internal clock
IMx=yyyy		ZeroCl=s	Alarm zero chlorine
FMx=yyyy		All RX=s	Alarm Redox
ISx=yyyy		SuperCl=s	Super-chlorination start
FSx=yyyy		Lev x = s	Change of status (s) for level "x" input
Res PSW	Reset password	Flow = s	Change of status (s) for FLOW input
Res Tar.	Reset offset / gain values	Off = s	Change of status (s) for OFF input
DST on	Summertime start	Imp = s	Change of status (s) for IMP input
DST off	Summertime end (back to standard time)		

MODBUS RTU

In this case, the communication takes place through the standard protocol by Modicon (<http://www.modbus.org/>). Data exchange takes place via “holding registers”, allocated as follows:

Command	Register no.	No. of registers	Action	Result
Read 0x03	101...108	1	Read the single register	Current value of selected measurement
Read 0x03	100	8	Read 8 registers (101...108)	Current value of measurements 1...8
Read 0x03	121	1	Read the single register	Current status of inputs #1
Read 0x03	122	1	Read the single register	Current status of outputs #2
Read 0x03	123	1	Read the single register	Current status of alarms #3
Read 0x03	121	3	Read 3 registers (121...123)	Status of inputs / outputs / alarms
Read 0x03	131	1	Read the single register	Current value 1st mA output
Read 0x03	132	1	Read the single register	Current value 2nd mA output
Read 0x03	131	2	Read registers 131 and 132	Current value of mA outputs
Read 0x03	1...94	1..16	Read registers	Value of related parameter
Write 0x06	1...94	1	Write the single register	Value of related parameter
Read 0x03	141...147	1	Read the single register	Value of the selected offset (M1...M7)
Write 0x06	141...147	1	Write the single register	Forcing selected offset value (M1...M7)
Read 0x03	151...157	1	Read the single register	Value of the selected gain (M1...M7)
Write 0x06	151...157	1	Write the single register	Forcing selected gain value (M1...M7)
Write 0x06	161...167	1	Write the single register	Calculation (and storage if within the limits) of the offset value for the selected measurement (M1...M7)
Write 0x06	171...177	1	Write the single register	Calculation (and storage if within the limits) of the gain value for the selected measurement (M1...M7)
Write 0x06	201	1	Write the single register (value 123)	Update parameters (to be performed after any modification of registers 1...94)
Write 0x06	202	1	Write the single register (value 123)	Microprocessor reset
Read 0x03	190	7	Read 7 registers (190...196)	Current date and time data, in the following order: Year, Month, Day, Day of the week, Hours, Minutes, Seconds
Write 0x10	190	7	Write 7 registers (190...196)	Date and time setting, in the following order: Year, Month, Day, Day of the week, Hours, Minutes, Seconds

#1: Encoding of the status of the inputs:

Input	Weight	bit
	32768	15
	16384	14
	8192	13
	4096	12
	2048	11
	1024	10
	512	9
	256	8
	128	7
	64	6
Imp	32	5
Off	16	4
Flow	8	3
Level 3	4	2
Level 2	2	1
Level 1	1	0

Note: for normal operation of the unit, all inputs must be ON, i.e. HR121 = 31

#2: Encoding of the status of the outputs:

Output	Weight	bit
	32768	15
	16384	14
	8192	13
	4096	12
	2048	11
	1024	10
Mixer	512	9
Perist. 3	256	8
Perist. 2	128	7
Perist. 1	64	6
EV	32	5
K5	16	4
K4	8	3
K3	4	2
K2	2	1
K1	1	0

#3: Encoding of the alarms:

Alarm	Weight	bit
Instrument block	32768	15
Service request	16384	14
Off	8192	13
Flow	4096	12
Level 1	2048	11
Level 2	1024	10
Super chlorinat.	512	9
Redox	256	8
Zero chlorine	128	7
RTC (clock)	64	6
pH stability	32	5
Start-up delay	16	4
Max. time K5	8	3
Max. time K4	4	2
Max. time K2	2	1
Max. time K1	1	0

Note: since the time limit for service request cannot be entered via "holding register", the related alarm will never trigger.

Notes:

- All registers are 16-bit.
- All values are without comma (therefore they must be correctly interpreted by the "Master").
- Parameters can be read individually or in blocks, but it is not possible to write more than one parameter at a time.
- Negative numbers are represented in two's complement.
- Any commands not included in the above table do not give any answer / effect.