Limpido EZ Duo

Electrolysis & pH regulation

Technical Manual v1.0

Warning
Carefully read this manual before installing, starting or using this device.

Contents

Reference	Version	Date
MPET0219	v1.0	19/02/2014

TECHNICAL DATA

General		**Electrolysis**	**EZ Duo 60**	**EZ Duo 100**	**pH regulation**	
Dimensions (lxhxd)	260x180x80	Chlorine production	16g/h	24g/h	Measurement range	3 to 10
Weight	6kg	Basin volume	20 to 60m^3	30 to 100m^3	Precision	0.2
Power supply	230V/50Hz	Cell cleaning	Polarity reversal		Setpoint range	7.0 to 7.6
Consumed power	150W	Salt ratio	2.5 to 5 g/l		Pump type	peristaltic
Degree of protection	IP-65	Max pressure	3 bar		Max flow rate	1.8l/h
Isolation	Class II	Max flow rate	22 m^3/h		Regulation mode	pH-

Delivered accessories		
Technical manual	Electrolysis cell with 50 mm dia. unions	pH probe + pH 7 standard solution
Fastening screws and pins	Flow rate detector	½" dia. pH injection nozzle & probe holder
Mini adjusting screwdriver	50mm/¾" dia. clamp	2 x 50mm /½" dia. clamps
	¾" dia. nipple	Crystal tube (4m)+ suction strainer

OVERVIEW

Limpido EZ Duo is an automatic swimming pool water treatment system. It is based on two principles : sterilisation by electrolysis of the salty water and regulation of the pH. Both of these principles combine to maintaining a pool's water healthy and limpid.

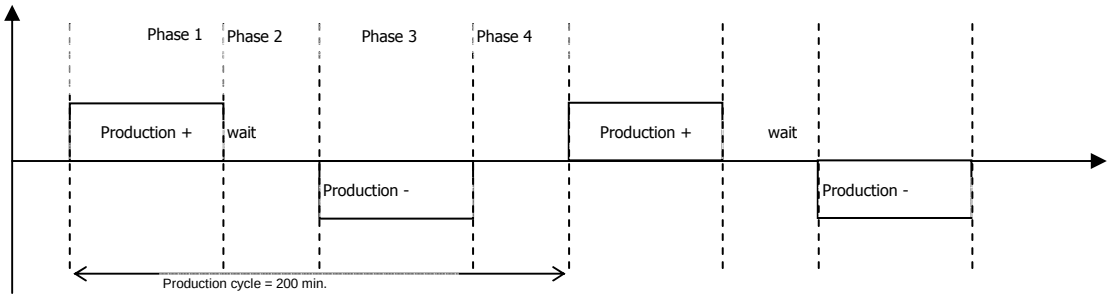
ELECTROLYSIS OF SALT

Electrolysis separates the salt (NaCl) of salty water into sodium (Na) and Chlorine (Cl). Chlorine dissolves immediately in the water producing hydrochlorous acid (HClO). This powerful disinfectant destroys bacteria and algae before it retransforms into salt.
The amount of chlorine needed to disinfect a pool increases with the temperature and the pH (alkalinity) of the water.

The production of chlorine must be adjusted acccording to the environment and the water's characteristics :

- the water's conductivity
- the water's temperature
- the volume of the basin to be treated
- the water's pH

For the installation's safety, the electrolyser produces chlorine only when the flow detector signals the circulation of water in the cell.
Thus, the electrolyser produces chlorine only during the filtration ranges determined by the swimming pool's electrical box's programming clock. Inside these filtration ranges, the production time is made up of cycles of two periods (Normal and Reverse) which alternate the polarity of the electrodes. This reversal of polarity prevents the scaling of the electrodes.



Thus, a production cycle is broken down into 4 phases :

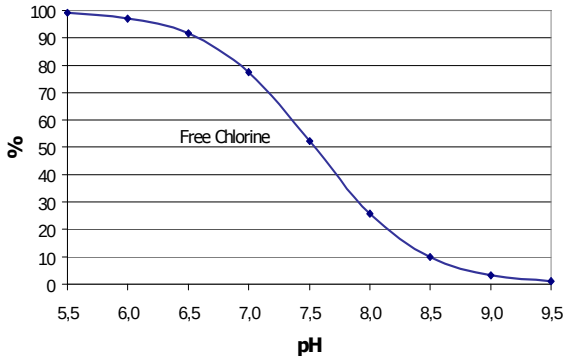
Phase 1, normal production.
Phase 2, rest.
Phase 3, production in reverse mode.
Phase 4, rest.

When a filtration range terminates, **Limpido EZ Duo** stops producing and when the filtration restarts, it resumes its cycle exactly at the point where it was interrupted.

The main advantage of this operating choice is to guarantee in all cases (even in the case of a power failure) the same normal or reverse production times and, as a result, to ensure the best possible descaling of the cell (enhancing production quality and equipment durability).

PH REGULATION

pH or the potential Hydrogen measures the degree of acidity of the water. Its value is between 0 and 14. A solution whose pH is equal to 7 is neutral. If it is less than 7, the solution is acid and if it is greater than 7, the solution is said to be a base or alkaline solution.
For bather comfort, treatment efficiency and installation reliability, the pH of the pool water must be maintained around 7.
A pH between 6.8 and 7.6 is generally considered to be correct.



A water which is too acid (pH <6.8) is aggressive for mucosae, favours the corrosion of metal parts and can damage plastics (liners).
A water which is too base (pH>7.8) can also be aggressive (caustic) and significantly reduce the efficiency of chlorine. Thus, when the pH increases from 7.2 to 8.2, the percentage of active chlorine decreases from 70% to 20%.
In addition, pH has systematically a tendency to increase due to the presence of salt in the water, making pH regulation particularly useful.

To obtain the best treatment efficiency, it is therefore indispensable to maintain the pH of the water between 7.0 and 7.6.
For information, the table to the right allows determining the required production time versus the basin volume, the pH for a water temperature of 25°C.

	Volume (m^3).			
pH	40	60	80	100
6.8	2h00	2h50′	3h50′	4h50′
7.0	2h10′	3h15′	4h20′	5h30′
7.2	2h30′	3h40′	5h00′	6h15′
7.4	3h00′	4h30′	5h50′	7h20′
7.6	3h40′	5h25′	7h15′	9h00′
7.8	4h40′	6h50′	9h15′	11h30′

Since the water temperature varies during the season, the filtration time has to be adjusted to increase production when the water temperature rises and to decrease production when the temperature drops.
To avoid any possible measurement errors, it is recommended **to check the calibration of the probe once a month**. To do this, simply follow the instructions in the CALIBRATION section.

EQUIPMENT DESCRIPTION

ELECTROLYSIS CELL

Your system's essential element, the cell, is equipped with solid plates made of titanium treated with ruthenium oxide. It is specially designed to offer a maximum service life and to limit maintenance operations.

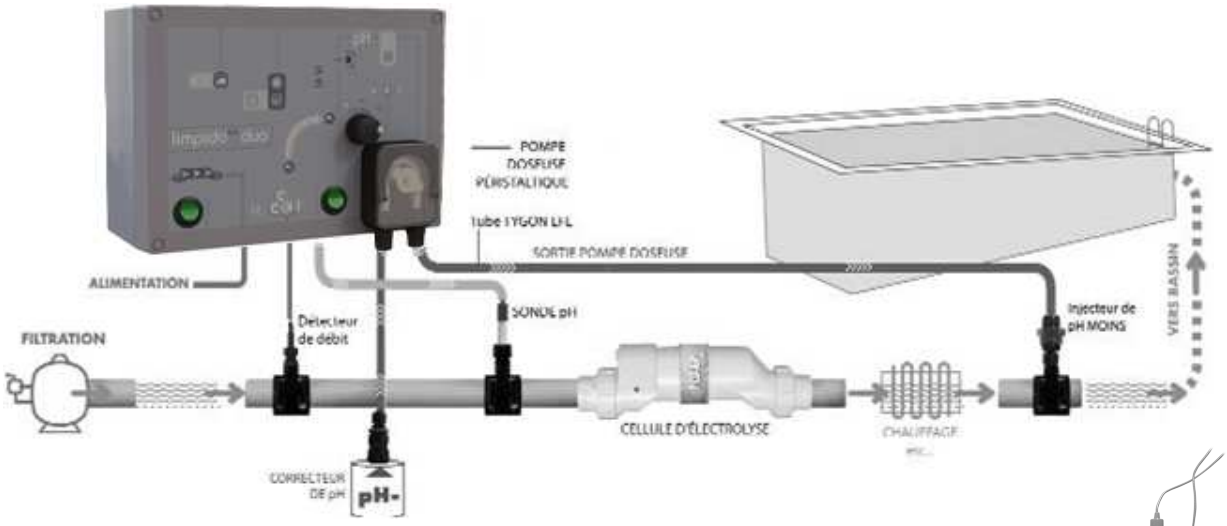
FLOW DETECTOR

The flow detector delivered with **Limpido EZ Duo** prevents the electrolyser from operating in the absence of flow or during a backwashing. It prevents any risk of hydrogen accumulation or excessive heating and thus reinforces the device's safety.

PH PROBE

The pH probe is made up of electrodes which apply a voltage proportional to the water's pH. The pH probe is fragile and must be carefully handled. It must be kept immersed in an aqueous solution.

INSTALLATION



INSTALLING THE PH PROBE

The pH probe is installed with a probe holder on a ½" dia. clamp. The probe holder must be screwed to the clamp with Teflon®.
Loosen the probe holder ring to insert or extract the probe.
Retighten the ring delicately when the probe is in the correct position.

INSTALLING THE INJECTOR

The injector allows introducing in the pool the required amount of product. The injector must be necessarily placed after the pH probe and as close as possible to the discharge in the basin.
The injector must be screwed to the ½" dia. clamp with Teflon®.
The tube is positioned on the injector by tightening the injector's upper nut.

INSTALLING THE FLOW DETECTOR

The detector is mounted on a ¾" dia. clamp. After installing the clamp without leaving any burr capable of hampering the displacement of the detector, screw the ¾" ¾" nipple on the clamp with Teflon® and then delicately screw the detector to the other end of the nipple. Whether the flow detector is installed horizontally or vertically, the arrow engraved on the detector must be pointing in the direction of the water's flow.

COVER CONTACT

This input must be connected to the drycontact of the cover's travel limit switch or the pool's flap. Thecontact must be dry, that is, a potential free contact, and must be closed when the cover is closed. Thanks to this contact, **Limpido EZ® Duo** is informed of the closing of the cover and therefore can adapt its production. A large part of chlorine consumption is linked to the exposure to the sun's ultraviolet radiation and to the frequentation. Therefore, when the pool is covered, the need for chlorine is greatly reduced. In **Automatic** mode (thermoregulated), **Limpido EZ® Duo** divides by 4 the chlorine production. For example, in curve 2, at 22°C, the daily production time drops from 8h to 2h if the flap is kept closed.

FORCED FILTRATION OPERATION

In **Automatic** mode (thermoregulated), **Limpido EZ® Duo** calculates the required production versus the measured water temperature, but since the device can produce only during the filtration ranges, it may prove necessary to force the filtration operation.
When the remaining time to terminate a 24-hour period drops below the daily calculated production time, **Limpido EZ® Duo** actuates a contact which allows forcing the filtration operation.

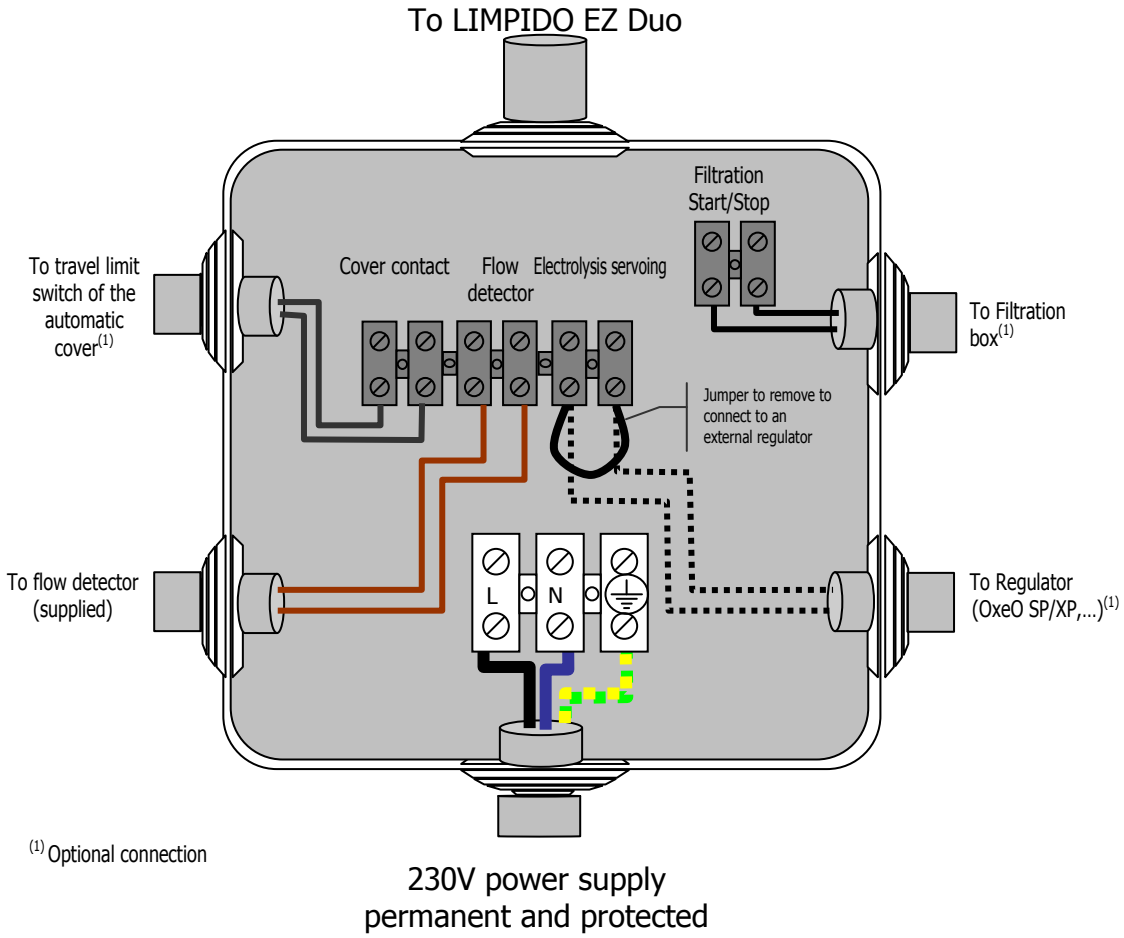
This contact must be connected to the "Forced Operation" terminal strip of the filtration electrical box (Terminal A-B of the CCEI electrical boxes) or to the filtration clock's contact.

ELECTROLYSIS SERVOING CONTACT

Limpido EZ® Duo may be connected to a programmer or a regulator to control production.
In particular, it may be connected to a Redox (ORP) or Chlorine measuring device. The measuring device must close the dry contact (totally potential free) when the Redox potential or the chlorine ratio is less than the desired value.
Limpido EZ® Duo is particularly adapted to operating with **OXEO SP**. Refer to this device's manual for details on how to connect to **Limpido EZ® Duo**.
In this type of operation, it is recommended to use the **Shock/Permanent mode.**

ELECTRICAL CONNECTION

For safety reasons, the **Limpido EZ® Duo** box must be installed more than 3.50 m from the pool edge.
The box must be placed on a flat, stable support. It must be supplied with a single-phase 230V 50Hz power supply and be protected by a 30mA differential circuit breaker in accordance with the applicable standards.
Limpido EZ® Duo is equipped with a flow detector and **must not be servoed to filtration**.
The electrolysis cell is connected directly to the box via the specific connector installed at the end of its cord.
All the other connections are made in the connecting box as shown below.



WARNING : it is strongly recommended to have a qualified professional make the electrical connection.

START-UP

WARNING : ONLY REGULAR ANALYSES ALLOW ADAPTING THE DEVICE'S PARAMETERS
Scrupulously following the steps below will ensure a trouble-free start-up.

CHECKING THE SALT RATIO

Limpido EZ Duo is designed to operate with a water conductivity corresponding to a salt content between 2.5g/l and 5g/l at 25°C.
To check with precision the salt ratio of your pool, we recommend using a conductivity tester. This very simple to use instrument allows a direct readout of the salt ratio in g/l. In addition, there are analysis strips to allow efficiently checking your water's salt content.
When the salt content is inappropriate, **Limpido EZ Duo** stops the production and turns on the "overproduction" indicator light in case of an excess amount of salt or the "underproduction" indicator light in case of a lack of salt. In case one of these indicator lights is lit, first make sure that the cell is correctly connected to the box and then that it is in good condition and make the necessary corrections on the pool water.

Water conductivity is not only proportional to the salt content, but also depends on the temperature at the rate of 2.2% per degree Celsius (°C).

	10°C	15°C	20°C	25°C	30°C	35°C	40°C
Min	3.3	3.1	2.8	2.5	2.2	2.0	1.7
Ideal	4.7	4.3	3.9	3.5	3.1	2.7	2.3
Max	6.7	6.1	5.6	5	4.5	3.9	3.4

Salt content in g/l

At 35°C the max salt ratio, therefore, goes from 5g/l to **3.9g/l**.

STABILISER

Chlorine is gaseous at room temperature. Its solid form (pebbles, granules, etc.) is obtained by association with a molecule of cyanuric acid. This cyanuric acid acts as a stabiliser since it protects the chlorine from the degradation that the sun's ultraviolet (UV) radiation subjects it to. On the other hand, this cyanuric acid is not consumed and inexorably accumulates in pools treated with chlorine pebbles and finally inhibits the chlorine potential. For public swimming pools, the maximum concentration of cyanuric acid is set at 80 ppm (or mg/l).
The treatment by electrolysis of the salt prevents such overdosing in cyanuric acid. However, it may prove useful to add between 25 and 50 ppm (or mg/l) of stabiliser when the pool is very exposed to sun and the chlorine concentration is insufficient.
In fact, in bright sunlight, 90% of the free chlorine is destroyed in two to three hours in the absence of cyanuric acid, while this proportion is lowered to 15% with 30ppm of stabiliser (cyanuric acid).

CHECKING TPA AND TH

At the installation time, it is recommended to test or have tested by a specialist the TPA (Total Phenolphthalein Alkalinity) and/or TH (Titration for Hardness) of the pool water. Both measurements are generally closely related and are often expressed in degrees Fahrenheit (°F). If TPA and TH are different, retain an average value of both of these measurements.
However, it is important to point out that a very soft water (TPA/TH <10°F) which offers the advantage of avoiding scaling is very corrosive, and its pH is very unstable.
Conversely, a very hard water (>35°F) which has a pH difficult to correct is very irritating for the skin and causes a rapid scaling of the installations. In extreme cases, it is therefore recommended to correct the TPA and the TH using appropriate chemical products.

Warning : the pH correctors used in pools are very corrosive and can have a harmful effect on health and on the environment. These chemical products must be handled with precaution and be stored in adapted premises.

CALIBRATION

Before proceeding with the so-called calibration, it is necessary to :

- **Set the set point to 7.0**
- Stop filtration (flow indicator light turns off)
- Take the probe out of the probe holder, **and then rinse and dry the probe**.
- Plug the probe holder (with a 5-cent coin).

Then the calibration takes place as follows:

- Plunge the probe in the 650 mV standard solution
- Adjust the **calibration** screw with the supplied adjusting screwdriver so that the central indicator light ● (green) turns on.
- Turn to the minus sign (-) if the left indicator light ◄ (red) is lit.
- Turn to the plus sign (+) if the right indicator light ► (red) is lit.

When the central indicator light ● (green) is lit, the device is calibrated.

- Reinstall the probe in the pool piping
- Restart filtration (the flow indicator light turns on)

The calibration procedure is terminated.

To avert errors due to the probe aging, calibration must be regularly checked (approximately once a month).

Important : after opening, the calibration solution **can only be preserved for a few months**. It must be **renewed at least each season** and even several times if your installation operates all year long.

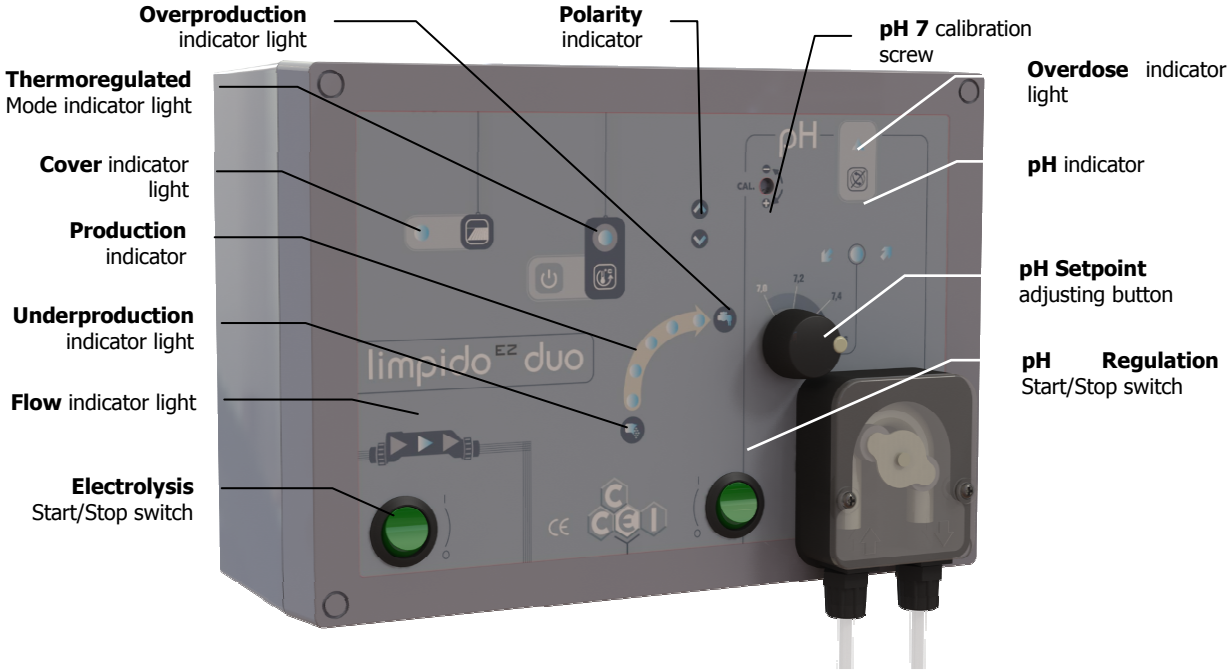
OPERATION

ELECTROLYSIS

INDICATOR LIGHTS AND BUTTONS

Electrolysis and pH regulation operate independently and can be started with the corresponding switch.

A luminous switch allows switching on the device. The indicator lights indicate the **Limpido EZ® Duo**'s operating state, while the key is used to select its operating mode.



MODE CHOICE

The key selects the electrolyser's operating mode.

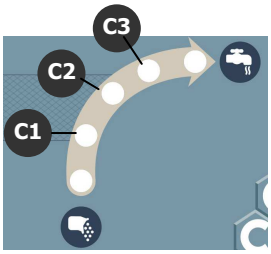
Shock / Permanent Mode (Indicator light unlit)

The device produces as long as the filtration is running.

Automatic / Thermoregulated Mode (Indicator light lit)

The production time is adjusted versus temperature. Depending on the pool size and its frequentation, a choice of 3 thermoregulation curves is available.

CURVE CHOICE



In Automatic mode, pressing and holding down the key for 3 seconds allows changing the adapted thermoregulation curve.

The indicator light corresponding to the active curve flashes. To select the next curve, briefly press the key.

To save the desired curve, press and hold down the key again for 3 seconds.

Limpido EZ® Duo recalculates the optimum production time and starts a new cycle.

The curve used by the device is displayed whenever production starts in **Automatic mode (thermoregulated)**. The green indicator light corresponding to the activated curve flashes for a few seconds.

LOW TEMPERATURE AND TEMPERATURE FAULT

In the **Automatic mode** (thermoregulated), the device stops producing when the temperature is less than 10°C. The thermoregulated indicator light intermittently turns on (1 periodic flash).
When the temperature rises above 11°C, **Limpido EZ® Duo** automatically resumes the treatment.
In case the device detects a temperature measurement fault, **Limpido EZ® Duo** switches to the **Permanent mode (Shock)**.

When the daily filtration duration is insufficient to allow producing the necessary time (**Automatic** mode), **Limpido EZ® Duo** actuates a contact to force the running of the filtration pump (cf § Forced filtration) and indicates its state by 5 periodic flashes of the **thermoregulated** indicator light.

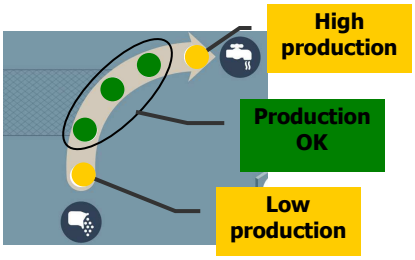
Thermoregulation indicator light	Description of the state
Unlit	Shock mode
Lit	Thermoregulated automatic mode
1 periodic flash	Water temperature too low to produce (<10°C)
5 periodic flashes	Filtration insufficient / Forced filtration
Permanently flashing	Temperature measurement error

POLARITY INDICATOR

The cell is cleaned by a periodic polarity reversal.
Two indicator lights indicate the production polarity. To preserve the service life of the cell's electrodes, a pause of several minutes separates the changing of polarity. During this pause, both polarity indicator lights alternately flash.

PRODUCTION INDICATOR

The production indicator allows checking the production level.



The production level is given by green and yellow indicator lights.
If no green indicator light is lit despite a production set to the maximum, then it is necessary to check the salt ratio.
If the yellow Low production indicator light and at least one of the three green indicator lights are lit, it means that the production level is optimum.

Limpido EZ® Duo is equipped with a protection device which stops production as soon as a production fault is detected.

 **Overproduction** This alert is generally caused by an excessive amount of salt in the pool or an increase of the water temperature. To avoid having an excess current damage the cell and the control relays, the device cuts off production as soon as such a situation is detected. Overproduction occurs mostly at the moment salt is added to the pool when the device is started before the salt is completely diluted. Check the salt ratio ; if the ratio exceeds 5g/l, the water should be drained and then the pool should be filled until a salt ratio less than or equal to 5g/l is obtained.	 **Underproduction** To avoid damaging the cell plates during an operation with not enough salt, the device is equipped with a detection device which stops the treatment as soon as there is a lack of salt. **Check the salt ratio ; if the ratio is less than 2.5g/l (2500ppm),** salt has to be added and production may be restarted only when the salt is completely diluted. If the salt ratio is correct, then either the cell is scaled or it is worn out. Consequently, the cell should be dismounted and the state of the plates checked. If necessary, descale it (cf *Cleaning the cell*).

In **Automatic mode** (thermoregulated) and if **Limpido EZ® Duo** could not produce throughout the required time despite forced operation, the device signals underproduction by flashing the  indicator light. In this case, the daily filtration time should be increased.

To cancel an overproduction fault, it is necessary to stop and then restart the device.

Since water conductivity decreases with temperature, the chlorine production decreases when the water cools. This phenomenon is taken advantage of to limit production in winter when the amount of chlorine needed to disinfect becomes very low.

PH REGULATION

PH INDICATOR

Indicator light ◀	Indicator light ●	Indicator light ▶
When the left indicator light is lit, it means that the water's pH is less than the setpoint value : The dosing pump is stopped.	When the central indicator light is lit, the water's pH is equal to the setpoint value : The dosing pump is stopped.	When the right indicator light is lit, the water's pH is greater than the setpoint value : The dosing pump is running.

PH SETPOINT

The rotary switch allows selecting one of the four setpoint values :
7.0 / 7.2 / 7.4 / 7.6
This value defines the threshold above which the pump starts running to add acid to the pool.

OVERDOSE INDICATOR LIGHT

To reduce the risk of overdose caused by a possible pH measurement error, **Limpido EZ® Duo** inhibits the pump from running if the pH is not corrected within 3h. Thus, the maximum volume injected in 24h is limited to 2.7 litres.

MAINTENANCE

SERVICING THE PH PROBE

When a pH probe is plunged in water, a film forms around the glass bulb at its end, and this film increases in thickness over time. This invisible film induces an increasingly longer response time, degradation of the slope and a drift from point 0 (pH 7). The drift from point 0 can be easily compensated for by a regular calibration. A temperature increase is also an important aging factor.

Probe preservation

Never keep the probe in distilled water.

Probes stored ″wet″ can be immediately reused ; probes stored "dry" necessitate a rehydration of several hours, but they will be less "aged".

Probe regeneration

A probe's service life can be extended by a periodic regeneration.

To regenerate a probe, simply soak the probe in a diluted hydrochloric acid solution (HCl 0.1M).

To obtain such a solution, add a few drops (8 to 10) of hydrochloric acid (HCl at 37%) in half a glass (5cl) of tap water.

WINTERING

In winter, and if climate conditions allow it, the treatment may be maintained while significantly reducing the frequency. An 8-hour filtration cycle every 15 days is sufficient in most cases.

However, the salt ratio must continue to be monitored to keep the cell from operating in a water with too low a salt content (<2g/l).

In case a tarpaulin or a cover is used, the chlorine is protected from UV radiation. To prevent an over-chlorination, the production level should be decreased accordingly.

To allow **Limpido EZ® Duo** to operate with cold water (below 18°C), the salt ratio has to be increased to 5g/l.

ADDING SALT

When the salt level drops below 2.5g/l, it is indispensable to add salt in the basin.

It is recommended to use salt specially treated for swimming pools and containing stabilisers. The electrolyser's efficiency will be significantly improved.

At the beginning of the season, we recommend checking the salt ratio and adjusting it to 4g/l. Depending on the measured salt ratio, the amounts of salt to be added are as follows :

Basin volume in m^3

Measured ratio	40	50	60	70	80	90
2.5g/l	60	75	90	105	120	135
3g/l	40	50	60	70	80	90
3.5g/l	20	25	30	35	40	45

Salt weight in kg to be added to reach 4g/l

CLEANING THE CELL

When the indicated production remains low despite a correct salt ratio, the cell's condition should be checked and it should be cleaned if scales are visible on the plates.

To clean the cell, plug one end and pour diluted acid in it (HCl at 10% is recommended). Let the acid act for several hours.

This operation must be performed with the greatest caution and the utilisation prescriptions for the used acid must be respected.

LIMPIDO EZ® DUO

Date of sale : .....

Serial number :.....

Declaration CE

The Bleu Electrique SAS Company (FR 47 403 521 693) declares that the LIMPIDO EZ Duo product satisfies the safety and electromagnetic compatibility requirements of the European directives 2006/95/EC and 2004/108/EEC.

Emmanuel Baret
Marseilles, 19/02/2014

Distributor Stamp

Simply Enjoy Water