

WATER BALANCE

POOL SHOP OR MANUAL WATER TESTING

The Pool Lab ASP will automatically test your pool or spa water for Free Chlorine and pH levels only. Other important water balance parameters such as Total Alkalinity, Calcium Hardness, Combined Chlorine, and Stabilizer level will need to be regularly checked manually with an appropriate test kit, or by taking a water sample to your local pool shop.

Your local pool shop should also be able to provide you with an appropriate water sample bottle for this purpose. It is worth noting that many containers are not suitable for pool water samples, as the materials used in the construction and the previous contents of the container may drastically alter the results of the water test.

DO NOT USE SOFT DRINK BOTTLES FOR WATER SAMPLES!

A soft drink bottle is a classic example of an inappropriate water sample container. The water sample will tend to gradually take on the pH level of the previous contents, which is generally quite acidic. Most soft drink bottles are also transparent, allowing UV light to enter the container which will break down the chlorine in the sample much faster than would occur in an opaque container.

Do not be alarmed if the Free Chlorine and pH results of a water test do not exactly match the readings observed on the display. The Free Chlorine and pH levels of a water sample are particularly sensitive to change in a small volume of water. Chlorine will break down rapidly, especially when exposed to heat and/or sunlight. This process can also affect the pH of the sample.

CHLORINE PRODUCTION AND CONTROL

Free Chlorine Residual

For your health and safety, a free chlorine residual of 1.0ppm to 3.0ppm must be maintained.

Testing for chlorine levels is very important and should normally be performed on a daily basis. The Pool Lab ASP achieves this better than any other method or device. Typically (by default) the ASP will test the chlorine level three times per day and will control the chlorine level by making adjustments to the chlorine output of your Pool Lab Chlorinator with calculations based on water volume, chlorinator rating and previous demand.

The ability of the chlorine generator to maintain the correct chlorine level will depend on the maximum output of the device (as rated in grams per hour), and the demand imposed by bather load and other environmental factors.

High Chlorine Demand

In the event the chlorine demand is beyond the capability of the chlorine generator, then a longer run time or occasional manual top-up dose with liquid chlorine may be all that is required.

During periods of hot weather and high pool usage you should expect that the demand on chlorine will be much higher than usual. Keep an eye on the free chlorine level, and have some liquid chlorine available to use if the free chlorine level drops below 1.0ppm.

In addition to hot weather and high bather load, there are a few other common reasons why chlorine demand might be higher than usual, these are:

1. Organic Debris – such as leaves, etc. in the water.
2. Low stabilizer level (applies to outdoor pools only).
3. High 'combined chlorine' level (explained on next page).

Chlorine Stabilizer – Cyanuric Acid

For outdoor pools Pool Lab highly recommends using stabilizer (Cyanuric Acid) at a concentration of between 50 – 80ppm. An outdoor pool exposed to sunlight will have extremely high chlorine demand without sufficient stabilizer in the water. Never exceed 100ppm concentration of cyanuric acid, as this will prevent the chlorine from sanitizing the water efficiently.

Combined Chlorine - Chloramines

A common cause for unusually high chlorine demand is the presence of chloramines in the pool water, detectable when a Total Chlorine test result is higher than a Free Chlorine test result by greater than 1.0ppm. The difference between these two test results is known as the “Combined Chlorine”. More advanced test kits will include the Total Chlorine test, otherwise you will need to have your water tested professionally to check for this.

Chloramines are formed when free chlorine reacts with ammonia like compounds called 'amines', and this will build up over time. Chloramines are a poor disinfectant and also reduce the disinfecting power of the free chlorine in the water. Chloramines are irritating to the eyes and respiratory system, and are responsible for the “chlorine smell” most noticeable around heavily used indoor pools.

As a general rule Pool Lab recommend shock dosing your pool with liquid chlorine at least once every swim season as this can significantly reduce chlorine demand and greatly improves the disinfecting power of the free chlorine in the water. For pools with heavier bather loads this may need to be done more often. An accurate measurement of the pool volume and combined chlorine level is essential for calculating the required amount of chlorine to perform the shock dose.

You should consult your local swimming pool professionals for advice on this procedure, and how often is appropriate for your pool.

Note: When shock dosing, avoid the use of persulfate based products as this can adversely affect water test results. Pool Lab recommends to shock dose with liquid chlorine.

pH CONTROL AND ACID DELIVERY

'pH level' refers to a logarithmic scale from 0 to 14, where 0 represents the acidic end and 14 represents the alkaline end. A pH of 7 is neutral.

Generally a pH level between 7.2 – 7.6 is suitable for most pool types, however those requiring a higher pH level will also require a higher chlorine residual.

Each pool finish and type has a specific range of pH that is suitable. You should seek advice from your local pool professionals or your pool documentation to establish the recommended pH for your pool.

Left unchecked, salt chlorination will over time increase the pH of your pool water to around 8.4, and any addition of liquid chlorine can increase it further.

A high pH level will reduce the effectiveness of chlorine and can potentially cause scale on the pool surfaces and equipment, and is irritating to the skin.

A low pH may cause the water to become corrosive, which can damage the pool surfaces and equipment, and is also irritating to the skin.

The Pool Lab ASP will (by default) test the pH in your water three times per day, and will automatically dose with dilute (16.5% maximum) Hydrochloric acid to maintain pH at the desired value.

Total Alkalinity (T.A.)

The total alkalinity is a measurement of all the alkalis in your pool water. This includes carbonates, bi-carbonates and hydroxides. It is measured in parts per million, or ppm.

These alkalis act as a “pH Buffer” which resist changes in the pH and help to keep the pH level stable.

The most common and recommended way of raising the total alkalinity is by the addition of sodium bi-carbonate (or bi-carbonate soda) to your pool water. Most pool shops will refer to this as “pH Buffer”.

More advanced home test kits will include a test for total alkalinity, otherwise you will need to have your water tested professionally to establish the correct dose to add.

The recommended T.A. for most pools is 80 – 120 ppm, depending on the interior finish. Consult your local pool professionals or your pool documentation for the recommended range for your pool.

Note: Reducing the total alkalinity is not as simple, and therefore over dosing should be avoided. Consult your local pool professionals for advice on this if required.

Calcium Hardness

Calcium Hardness is a measurement of the level of calcium in the water, and may be referred to as “water hardness”. It is measured in parts per million, or ppm.

This is often one of the most ignored parameters, yet just as important as the others.

The hardness of your pool water is very important in controlling scale and the corrosive effects of water.

A low calcium level may cause pool water to become corrosive, even if the pH is within the recommended range. Left unchecked this can damage the pool interior finish, and the equipment.

A high calcium level may cause the pool water to deposit scale even if the pH is within the recommended range. Scale build up on the pool surfaces can be unsightly and difficult to remove, and it will also build up inside the pool equipment.

Scale can be particularly harmful to heating equipment as it can severely reduce the efficiency of a heat exchange.

Scale can also build up on the plates inside your salt chlorinator cell. If left unchecked this will damage the cell, and also risk voiding your warranty if it is not cleaned regularly.

Pool Lab Chlorinator cells feature a 'self-cleaning' design, but this will only work if your pH, Total Alkalinity and Calcium Hardness parameters are within an acceptable range.

Generally a calcium hardness level between 100 – 200 ppm is recommended for most pools. Consult your local pool professionals or your pool documentation for the recommended range for your pool.

The calcium hardness level can be raised by the addition of calcium chloride to the water. Pool shops usually referred to this as “Hardness Increaser” or similar. Always test the water first before adding this as some water sources may already have significant hardness depending on where it comes from.

In some cases the initial calcium hardness may be well above the recommended range, and in these cases we recommend using the Langlier Index to determine an ideal pH value that will prevent this water from scaling. See next page.

High Calcium (Hard) water sources – the Langelier Saturation Index

The Langelier Saturation Index (Si) is a relationship between the Calcium Hardness, Total Alkalinity, pH and water temperature. When the water is balanced correctly, the Si value should be somewhere between -0.2 and +0.2. A value lower than -0.2 indicates the water is corrosive, and a value higher than +0.2 indicates the water is scaling.

If you are in a situation where the water source for the pool contains a higher level of calcium than is recommended for your pool, then this index can be very useful. It will allow you to find a pH value that will not be corrosive or scale forming, and this pH value will generally be slightly lower than what would normally be recommended for your pool.

The following formula and reference chart can be used to find the current Si for your water. You will need to know the pH level, Total Alkalinity, Calcium Hardness and Temperature of your water.

Use the chart to determine the values for Ti, Ci, and Ai, and insert these values into the formula, along with the measured pH value to determine your Si value.

If you get an Si value higher than +0.2, then your water is scaling. In this case you should reduce the pH in your water by the value of Si to ensure your water is neither scaling or corrosive.

$$\mathbf{Si = pH + Ti + Ci + Ai - 12.1}$$

Temperature Degrees C	Ti	Calcium Hardness	Ci	Total Alkalinity	Ai
12	0.3	75	1.5	75	1.9
16	0.4	100	1.6	100	2.0
19	0.5	125	1.7	125	2.1
24	0.6	150	1.8	150	2.2
29	0.7	200	1.9	200	2.3
34	0.8	250	2.0	250	2.4
39	0.9	300	2.1	300	2.5
		400	2.2	400	2.6
		600	2.4	600	2.8
		800	2.5	800	2.9

Example:

pH = 7.6, Temp = 24 (Ti = 0.6), **Calcium = 400** (Ci = 2.2), **Alkalinity = 125** (Ai = 2.1)

Si = 7.6 + 0.6 + 2.2 + 2.1 – 12.1,

Si = +0.4, so the water is scaling.

In this case we would take 0.4 away from the measured pH to find the ideal pH is 7.2. A pH value anywhere between 7.0 and 7.4 would be acceptable in this case.