

Supelco®

1.11174.0001

MQuant®

## Chlorine and pH Test

Cl<sub>2</sub>  
pH

for the determination of free chlorine, total chlorine, and pH

## 1. General

Swimming-pool water is disinfected by means of chlorine-releasing compounds or chlorine gas ("chlorination"). The chlorine content ("total chlorine") of swimming-pool water is made up of the sum of "free chlorine" and "combined chlorine". "Free chlorine" is understood as the sum of dissolved chlorine (Cl<sub>2</sub>), hypochlorous acid (HOCl), and hypochlorite ions (ClO<sup>-</sup>). The disinfectant effect of free chlorine is essentially due to hypochlorous acid. "Combined chlorine" consists of chloramines which as oxidative substances similarly contribute to the disinfection.

The swimming-pool water must contain **at least 0.3 mg/l of free chlorine** throughout the entire pool to immediately kill off the pathogens and bacteria imported by the bathers.

Chlorination may produce a drop or rise in the pH of the water. As a measure to guarantee an optimal degree of disinfection and to prevent health risks as well as corrosion and lime deposits, a pH in the range of 7.1 - 7.6 is recommended, in the case of very soft waters in the range of 7.0 - 7.5.

## 2. Method

## Colorimetric determination with color-matching vessel

In weakly acidic solution **free chlorine** reacts with diethyl-p-phenylenediamine (DPD) to form a red-violet dye. **Combined chlorine** reacts only after the addition of iodide ions. **This permits free chlorine to be distinguished from combined chlorine.**

The **pH determination** takes place by means of chlorine-resistant phenol red indicator solution, which changes color from yellow to red-violet in the pH range of 6.5 - 8.2.

The chlorine concentration and the pH are each determined **semiquantitatively** by visual comparison of the color of the measurement solution with the color zones of a color-matching vessel.

## 3. Measuring range and number of determinations

Measuring range / color-scale graduation	Number of determinations
0.1-0.3-0.6-1.0-1.5mg/l Cl <sub>2</sub>	200
pH 6.8-7.1-7.4-7.6 - 7.8	200

## 4. Applications

## Sample material:

Swimming-pool water

This test is **not suited** for seawater.

## 5. Reagents and auxiliaries

## Please note the warnings on the packaging materials!

The test reagents are stable up to the date stated on the pack when stored closed at +15 to +25 °C.

## Package contents:

2 bottles of reagent Cl<sub>2</sub>-1  
1 bottle of reagent Cl<sub>2</sub>-2  
1 bottle of reagent Cl<sub>2</sub>-3  
2 bottles of reagent pH-1  
1 graduated 12-ml plastic syringe  
1 color-matching vessel  
1 card with brief instruction

## Other reagents and accessories:

MQuant® Chlorine Test, Cat. No. 117925,  
measuring range 0.5 - 20 mg/l Cl<sub>2</sub>  
MQuant® Universal indicator strips pH 0 - 14, Cat. No. 109535  
Sodium hydroxide solution 1 mol/l Titipur®, Cat. No. 109137  
Sulfuric acid 0.5 mol/l Titipur®, Cat. No. 109072

## Refill packs:

## Cat. No. 111157

MQuant® Chlorine and pH Test  
Reagents for chlorine (Cl<sub>2</sub>-1, Cl<sub>2</sub>-2, Cl<sub>2</sub>-3) - Refill pack for 111174  
(Reagents **without technical accessories** for 200 determinations of free chlorine or total chlorine)

## Cat. No. 111143

MQuant® Chlorine and pH Test  
Reagent for pH (pH-1) - Refill pack for 111174  
(Reagent **without technical accessories** for 400 pH determinations)

## 6. Preparation

- **Analyze immediately after sampling!**
- Check the chlorine content with the MQuant® Chlorine Test. Samples containing more than 1.5 mg/l Cl<sub>2</sub> must be diluted with distilled water.
- **Determination of free chlorine and total chlorine: The pH must be within the range 4 - 8.**  
Adjust, if necessary, with sodium hydroxide solution or sulfuric acid.

## 7. Procedure

Sampling site: approx. 50 cm from the pool edge,  
at a water depth of approx. 20 cm

## Determination of free chlorine:

Rinse the color-matching vessel several times with the pretreated sample.		
Reagent Cl <sub>2</sub> -1	5 drops <sup>1)</sup>	Place into the color-matching vessel.
Reagent Cl <sub>2</sub> -2	1 drop <sup>1)</sup>	Add.
Pretreated sample (5 - 40 °C)	10 ml	Add with the syringe, close the vessel with the stopper, and mix.
<b>Immediately</b> hold the color-matching vessel in front of a white background, e.g. the backside of the brief-instruction card, and determine with which color zone of the chlorine scale the color of the measurement solution coincides most exactly.		
Read off the result in mg/l Cl <sub>2</sub> from the vessel: <b>result A (free chlorine)</b>		

<sup>1)</sup> **Hold the bottle vertically while adding the reagent!**

## Determination of total chlorine:

Reagent Cl <sub>2</sub> -3	3 drops <sup>1,2)</sup>	Add to the measurement solution for <b>free chlorine</b> , close the vessel with the stopper, and mix.
<b>Leave to stand for 1 min.</b>		
Hold the color-matching vessel in front of a white background, e.g. the backside of the brief-instruction card, and determine with which color zone of the chlorine scale the color of the measurement solution coincides most exactly.		
Read off the result in mg/l Cl <sub>2</sub> from the vessel: <b>result B (total chlorine)</b>		

<sup>1)</sup> **Hold the bottle vertically while adding the reagent!**

<sup>2)</sup> In the event that the color of the solution becomes paler or completely disappears after the addition of reagent Cl<sub>2</sub>-3, the entire analysis must be repeated, this time increasing the amount of reagent Cl<sub>2</sub>-1 by 1 - 2 drops.

## Calculation of the content of combined chlorine:

$$\text{mg/l combined chlorine} = \text{result B} - \text{result A}$$

## Evaluation:

- **The content of free chlorine should be within the range 0.3 - 0.6 mg/l.** If the content of free chlorine is lower than 0.3 mg/l, more chlorinating agent must be added.
- **The content of total chlorine should not be higher than 1.0 mg/l.** Otherwise the inflow of fresh water must be increased.

## Note on the measurement:

If the color of the measurement solution is equal to or more intense than the darkest color on the scale, repeat the measurement using **fresh**, diluted samples until a value of less than 1.5 mg/l Cl<sub>2</sub> is obtained.

Concerning the result of the analysis, the dilution (see also section 6) must be taken into account:

$$\text{Result of analysis} = \text{measurement value} \times \text{dilution factor}$$

## Determination of the pH:

Rinse the color-matching vessel several times with the sample.		
Sample (15 - 25 °C)	10 ml	Inject into the color-matching vessel with the syringe.
Reagent pH-1	4 drops <sup>1)</sup>	Add, close the vessel with the stopper, and mix.
Hold the color-matching vessel in front of a white background, e.g. the backside of the brief-instruction card, and determine with which color zone of the pH scale the color of the measurement solution coincides most exactly.		
Read off the pH from the vessel.		

<sup>1)</sup> **Hold the bottle vertically while adding the reagent!**

## Evaluation:

If the pH is lower than 7.1, an alkalizing agent ("pH enhancer"; e.g. sodium hydroxide solution, sodium carbonate) must be added. If the pH is higher than 7.6, acid or a "pH reducer" (e.g. hydrochloric acid, sodium hydrogen sulfate) must be added.

## Note on the measurement:

If the color of the measurement solution corresponds to the lowest or highest value on the scale, the actual pH value may lie outside the measuring range.

## 8. Notes

- Reclose the reagent bottles immediately after use.
- **As a rule rinse the color-matching vessel and the syringe several times with distilled water before every determination and after use, in particular after determining the total chlorine content.**
- **Information on disposal can be obtained at [www.disposal-test-kits.com](http://www.disposal-test-kits.com).**

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