ACTIW WATER Disinfectant - INSTRUCTIONS FOR USE

DISINFECTION OF HOT TUBS

Agent: Actiw Water 2000 ppm HOCl
Objective: To remove bacteria, biofilm and disinfect the water system and the surface of the hot tub.

STEP 1: Preparing the hot tub

Turn off the filtration and heating system. **Empty** the tub of water if it has already been used. **Clean** the internal surfaces **mechanically** (sponge, no detergent). **Fill the hot tub with water** to the operating level - so that the jets are covered.

STEP 2: Addition of ACTIW WATER

Dosage for shock disinfection: 2% solution of Actiw Water 2000 ppm = 20 ml/litre of water (i.e. 20 litres of Actiw Water per 1000 litres of water)

Example: If a hot tub has a 600 litre capacity:

600 l × 2% = **12** litres of Actiw Water

*"This dose raises the O**RP value > 850 mV**, effectively eliminating bacteria and biofilm."*

STEP 3: Timing

Allow the solution to circulate (turn on jets, massage system) for **a minimum of 30 minutes - ideally up to 1 hour**. When finished, **switch off the system** and allow the water to **stand still for an additional 30 minutes** (if possible).

STEP **4:** Rinsing

Let all the water out of the hot tub. Fill with fresh water. Run the jets for a few minutes and then rinse again. Let the water out and fill the hot tub with fresh, clean water for use.

STEP **5:** C**ontrol**

Measure ORP and pH after filling with fresh water. Target pH: **6.5-7.2**, ORP: **650-800 mV** (maintain continuous disinfection - a small amount of HOCl 5-10 ppm can be added to the running water)

FINAL REMARKS

Actiw Water (HOCl) in this concentration **does not contain chlorine gas or cause an irritating odour**. It is **safe for acrylic surfaces, PVC pipes and users**, provided it is flushed properly. Regular disinfection (every 1-2 weeks or after each user group) prevents biofilm formation.

What can increase the demand for ACTIW WATER (HOCl 2000 ppm)?

1. Presence of biofilm

Biofilm is a layer of bacteria and organic contaminants that adheres to the walls of pipes, nozzles and tanks. **HOCl first oxidises the biofilm** before it begins to act on free bacteria.
Therefore, in installations **with developed biofilm, a significant portion of Actiw Water is consumed** before it reaches the required ORP.

=> In this situation, it is necessary to add an additional amount of product to achieve the target level of disinfection.

2. Organic and chemical pollutants

Sweat, sebum, cosmetics, urine, detergent residues - all these substances 'absorb' HOCl. The greater the contamination, the **higher the dose needed for an effective chemical reaction** and to achieve an ORP ≥ 800-900 mV.

3. High **pH (>7,5)**

HOCl loses activity at high pH - instead of effective hypochlorous acid, a less active hypochlorite ion (OCl-) is produced. In this case, **it is necessary either to correct the pH to 6.5-7.2 or to use a higher dose of HOCl.**

4. High volume or complexity of installation

The more branched or extensive the installation, the more surfaces covered by biofilm.
In addition, dead zones (e.g. buffer tanks, standpipes) may require more saturation with disinfectant.

% concentration	volume for **1000 l w**ater	Purpose/Considerations
2%	20 litres	Standard disinfection, light biofilm deposit
3%	30 litres	Presence of biofilm, organic contamination
4%	40 litres	Advanced biofilm, low ORP despite a dose of 2-3%

=> E.g. instead of **12 litres (2%) for a 600 litre hot tub**, **18 litres (3%)** or even **24 litres (4%)** should be used if the ORP does not reach the disinfection level, if the biofilm is pronounced.

RECOMMENDATIONS: monitor ORP after adding HOCl. If it does not reach ≥ 800 mV after 30 minutes, add another 0.5-1% (e.g. 5-10 l per 1000 l).

Do not exceed pH 7.5 - correcting with acid is cheaper than wasting HOCl. When using more HOCl - **a technical inspection of the installation is recommended** (sediment, dead zones, filters).

Mains water in Poland (and throughout the EU) **usually has a pH between 7.0 and 8.0.**

What raises the pH in hot tubs and pools? In an enclosed environment, such as a hot tub or swimming pool, pH tends to rise for several reasons:

1. Water aeration. The hot tub has **jets that strongly aerate the water** → this causes CO_2 to escape from the water. As CO_2 escapes, the pH increases (a phenomenon known as carbon dioxide outgassing).

2. Organic load (sweat, cosmetics, urine, detergents). Some organic compounds act as alkaline buffers **→ maintain or raise pH.**

3. Addition of unsuitable chemicals. Some disinfectants on the basis of sodium hypochlorite (NaOCl) or calcium ($Ca(ClO)_2$) are strongly alkaline - pH >11. If you have previously used such agents, the pH in the water may have been raised.

4 Poor quality of the make-up water. If so-called "hard water" with a high calcium and magnesium content is added to the hot tub, the pH can also rise (carbonate alkalinity).

Practical conclusion: Control the pH in the hot tub, in the pool. Keep the pH between 6.5 and 7.2, especially if you use HOCl (Actiw Water). If necessary, lower the pH with: citric acid,specialised pH regulators (e.g. pH minus).

Why the redox value is so important in disinfection:

Whether a pathogen (viruses, bacteria, fungi) survives in a given environment largely depends on the oxidation level of the environment. Therefore, in order for disinfection to be considered effective, care must be taken to achieve and maintain the correct oxidation - redox - level. **ACTIW WATER** is the product with the highest oxidation potential on the market, which results in its exceptional efficacy against pathogens in the aquatic environment.

Disinfection efficiency as a function of redox potential (ORP)

< 400 mV

No effective disinfection. Microorganisms survive.

~ 450 mV

Onset of elimination of faecal bacteria, e.g. *E. coli.*

500–550 mV

Removal of *E. coli*, limited effectiveness against other bacteria.

600–650 mV
Effective neutralisation of *Pseudomonas aeruginosa*, some gram-negative bacteria.

650–700 mV
Elimination of *Legionella pneumophila* in biofilm-unprotected water.

700–750 mV
Neutralisation of most viruses (adenoviruses, enteroviruses, noroviruses).

750–800 mV
Comprehensive disinfection: high efficacy against bacteria, viruses and fungi.

> 850 mV
Shock disinfection: effective penetration of biofilm, elimination of latent bacteria (e.g. *Legionella, Pseudomonas*), complete disinfection of pipes, filters and tanks.

> 900 mV
Use only **when no people are present**. Extreme disinfection, rapid destruction of biological structures.

ACTIW WATER is an effective concentrate with a concentration of 2000 ppm of pure HOCL acid for removing biofilms from circulating water systems in hot tubs and swimming pools, where bacteria thrive in the pool filters just above the bottom. The inability to fluidise the deposits used for swimming pool filtration causes constant problems with the growth of large amounts of bacteria in water filtration systems. The problem is that bacteria thrive in swimming pools with increased water temperatures, where ideal conditions for their growth are created. As a rule, these are mostly hot tubs and recreational pools. If oxidants cannot reach them directly, clusters of biofilms form in the blocked beds at the bottom, multiplying by the millions per hour. Therefore, it is important to choose the right filter media technology and to rinse the filters regularly so that the bed is constantly loosened, allowing the disinfectant to reach the lower parts of the filter mass. An example of a bed with such characteristics, rapid and thorough regeneration of the bottom, is **ACTIW FILTER**. The bed has unique filtration properties.
Due to its specific crystalline structure, it has adsorption capacity and the ability **to retain microbial contaminants** on its surface. In addition, it has the ability **to bind heavy metal cations and ammonium compounds**. Reduces radioactive elements.

This characterisation of the deposit allows specific technological effects to be achieved:
- molecular biological sieve: ability to retain micro-organisms such as *E.coli* bacteria, parasites etc.
- filtration at a level of 2-5 microns (quartz bed 10-30 microns)
- reduced filtration resistance by 30% - reduced energy load on submersible pumps
- reduced backwash regeneration times of up to 50%
- ability to bind heavy metal cations

DISINFECTION OF WELLS

Addition of disinfectant

Pour **approximately 20 litres of Actw Water (HOCl) solution** into the casing pipe through the inspection hole.

DISTRIBUTION IN THE INSTALLATION

Gently open all taps, each separately, including the hot water.
Wait a few minutes until there is a slight smell of chlorine in the water or use a meter to obtain an ORP value of 850 in each tap.

TIME OF OPERATION

Close the taps and leave the installation for 1-2 h for the disinfectant to work effectively.

SYSTEM FLUSHING

After this time, open all taps and flush the system with clean water.

If a lot of impurities (dirty water) appear during flushing, the disinfection process must be repeated.

PERFORMANCE MONITORING

To check the effectiveness of disinfection, it is recommended to measure the **ORP (redox)** in the water.
Micro-organisms are killed at high levels of oxidation: **750-850 mV**.
ACTIW WATER ensures that this ORP level is achieved.
The measurement can be easily performed with commercially available ORP testers.

DISINFECTION OF DRINKING/STORAGE WATER TANK

A very similar procedure, but made easier by access to the interior:
Step by step:

1. Empty the tank completely.
2. Spray the walls thoroughly with pure Actw Water (2000 ppm) - e.g. using a backpack sprayer.
3. Leave the product on for about 30 minutes - do not rinse immediately.
4. Optionally, fill the tank and add Actw Water at a concentration of 0.5-1% (e.g. 5-10 l per 1000 l).
5. Keep circulating (if the tank has a pump) or stir manually, obtain an ORP of 850 mV for 1 hour.
6. Drain and rinse thoroughly.

IMPORTANT INFORMATION:

Do not use in the sun - UV radiation degrades HOCl.

Use an ORP meter

Actiw Water disinfection is safe - it does not need to be neutralised (like chlorine), and the water can be poured onto the green area after treatment.

EXAMPLES OF INCREASED DOSES OF ACTIW WATER **(HOCl 2000 ppm)**

% concetration	volume for **1000 l w**ater	Purpose/Considerations
2%	20 litres	Standard disinfection, light biofilm deposit
3%	30 litres	Presence of biofilm, organic contamination
4%	40 litres	Advanced biofilm, low ORP despite a dose of 2-3%

RECOMMENDATIONS:

Always monitor the ORP after adding HOCl. If it does not reach > **800 mV after 30 minutes, add another 0.5-1%** (e.g. 5-10 l per 1000 l).

Do not exceed pH 7.5 - correcting with acid is cheaper than wasting HOCl.

A typical **domestic well** (dug or drilled) can have very different water capacities - depending on type, diameter, depth and groundwater level.

Here are indicative values:

- Dug well (traditional):

Diameter: usually 80-120 cm

Depth: 5-12 metres

Water resource: 1-3 m water column

- Volume calculation (example):

Diameter 1 m = radius 0,5 m

Water at height of 2 m:

→ $V = \pi \times r^2 \times h \approx 3{,}14 \times 0{,}5^2 \times 2 =$ **~1,57 m³** = **1570 litr**es

- Drilled well (deep well):

Diameter: 100-200 mm (10-20 cm)

Depth: 15-50 m

Water resource: depends on the level of the water table, but typically:

10 m water column in a pipe Ø 125 mm = approx. 123 litres

- Approximate formula for the pipe:

V (litres) ≈ 0,0123 × water column height (in metres) × (diameter in mm)²

Well type	Diameter	Water column	Capacity
Dug – shallow	1 m	1,5 m	~1175 litres
Dug – deeper	1,2 m	2,5 m	~2827 litres
Drilled **– 125 mm**	20 m	10 m	~123 litres
Drilled **– 160 mm**	30 m	10 m	~205 litres

Table for **ACTIW WATER 2000 ppm**, added to **100 litres of water.**

ACTIW (L)	**HOCl (ppm)**	**ORP (mV)**	Concentration **[%]**	What is disinfected (typical)	Disinfection time*
0.1	2 ppm	~650	0.10%	General bacteria (*E. coli*, streptococcus)	1–2 min for *E. coli*
0.2	4 ppm	~800	0.20%	*E. coli*, fungi, certain viruses	1 min – *E. coli*; 2–3 min – fungi
0.25	5 ppm	~850	0.25%	*E. coli, Legionella*, viruses, algae	*E. coli*: 30–60 s; Legionella: 2–5 min
0.3	6 ppm	~900	0.30%	*Legionella*, biofilm, bacterial spores, viruses	*Legionella*: 1–2 min; biofilm: 10–15 min

Remarks:
HOCl (hypochlorous acid) acts faster and more effectively than sodium hypochlorite, especially at higher ORP (≥850 mV).
Disinfection times are approximate and depend on temperature, pH and the presence of organic matter. *Legionella* and biofilms are more resistant - they need higher concentrations and longer times.
Recommended range for **drinking water**: 2-6 ppm HOCl, ORP 700-900 mV.