Safe and Effective Disinfection with Sodium Chloride

Electrolysis Systems CHLORINSITU®

ProMaqua®
a ProMinent Company

Printed in Germany, PT PM 095 10/09 GB

Environmentally-Friendly Water Disinfection

Electrolysis is an economically sensible and technically perfected alternative to the dosing of sodium hypochlorite or other disinfectants. Chlorine, hydrogen and sodium hydroxide can be generated on site from harmless sodium chloride. The chlorine generated can either be dosed directly into the water as hypochlorous acid (HOCl) or temporarily stored with the sodium hydroxide generated as sodium hypochlorite (NaOCl).

- Simple and safe disinfection with sodium chloride
- No storage, transport or handling of hazardous chemicals
- Chlorine generation and pH correction with one system (CHLORINSITU® IV plus/compact)
- Maximum operating reliability thanks to its design as a vacuum pressure system

Output overview of CHLORINSITU® products

	CHLORINSITU® IV compact	CHLORINSITU® II	CHLORINSITU® III	CHLORINSITU® IV	CHLORINSITU® IV plus
Output [g/h] 5,000			■	■	■
2,000		■	■	■	■
1,000		■	■	■	■
500		■	■	■	■
200		■	■	■	■
100		■	■	■	■
50		■	■	■	■
20		■	■	■	■
Production of HOCl	■			■	■
Production of NaOCl		■	■		■
Applications					
Drinking water	■	■	■	■	■
Process water		■	■	■	■
Swimming pool water	■	■	■		■

Tubular Cell Electrolysis Systems CHLORINSITU® II
are robust systems, in which electrolysis takes place in a chamber common to both electrodes. The chlorine gas generated is therefore immediately converted with sodium hydroxide to form a diluted sodium hypochlorite solution.

Membrane Electrolysis Systems CHLORINSITU® III
generate an ultra-pure and low-chloride sodium hypochlorite. Electrolysis takes place in two electrode chambers that are separated by a membrane. This creates a spatial separation between the chlorine and sodium hydroxide. The chlorine and sodium hydroxide are combined after electrolysis for further use and are temporarily stored as a sodium hypochlorite solution.

Electrolysis Systems

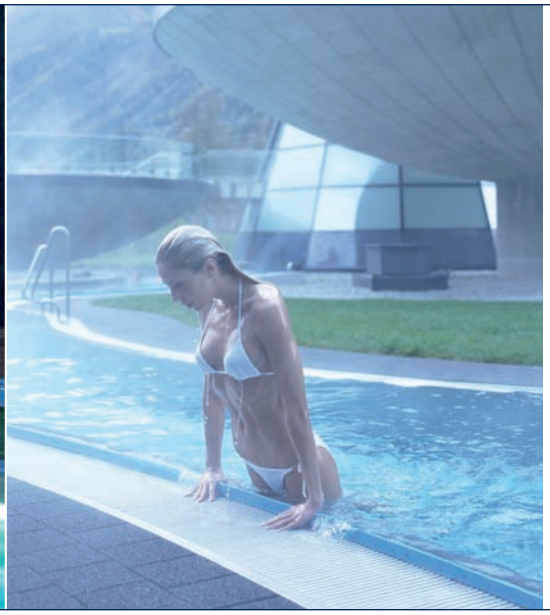
Membrane Electrolysis Systems CHLORINSITU® IV compact are especially suitable for small swimming pools, whirlpools and other applications requiring chlorine. Electrolysis takes place in two electrode chambers that are separated by a membrane. This creates a spatial separation between the chlorine and sodium hydroxide. The chlorine is transferred into the water to be treated where it dissolves as hypochlorous acid. The sodium hydroxide is collected separately and can be used to correct the pH value of the water being treated.

Membrane Electrolysis Systems CHLORINSITU® IV generate ultra-pure chlorine gas in a vacuum process. Hypochlorous acid can be dosed and the pH value can be simultaneously corrected with these systems. Electrolysis takes place in two electrode chambers that are separated by a membrane. This creates a spatial separation between the chlorine and sodium hydroxide. The chlorine gas dissolves in the water being treated as hypochlorous acid. The chloride-free sodium hydroxide is stored temporarily and can be used to correct the pH value.

Membrane Electrolysis Systems CHLORINSITU® IV plus like the CHLORINSITU® IV, generate ultra-pure chlorine gas in a vacuum process and therefore permit hypochlorous acid to be dosed while simultaneously correcting the pH value. Additionally, excess chlorine gas can be bound with sodium hydroxide and then temporarily stored as sodium hypochlorite used to cover demand peaks.

Further information:
www.promaqua.com/electrolysis

Top Quality to Meet Your Every Need



Safety and reliability
Attention was consciously focused on operational reliability when designing CHLORINSITU® systems. The membrane systems of the series III and IV systems in particular are operated at a constantly monitored vacuum pressure so that electrolysis is interrupted at the least sign of a leak.

Process water is treated by an integral water softening system to increase the lifespan of electrolysis cells. All systems with an output of 50 g/h or more incorporate an ATEX-certified ventilation system for removal of the hydrogen produced.

All systems with an output of 600 g/h or more are fitted as standard with online monitoring of the integral water softening system and a gas warning device.

Should an operational malfunction nevertheless occur, the system can be remotely diagnosed using the integral modem. Fault elimination measures can therefore be quickly and easily performed or initiated by phone. Optionally, fault messages can be transmitted by SMS or GSM to mobile phones or e-mail addresses.

Simple to operate
Modern controllers monitor all key functions and provide essential operating information in plain text.
The operation of the system is simplified by the modern touch panel (systems with an output of > 50 g/h). It is possible to integrate the units into central control systems by means of various communication interfaces.

Complete delivery
Systems are supplied wired and ready for connection including salt-dissolving containers. Systems of up to 50 g/h are accommodated in corrosion-proof plastic housings, larger systems in powder-coated stainless steel frames.

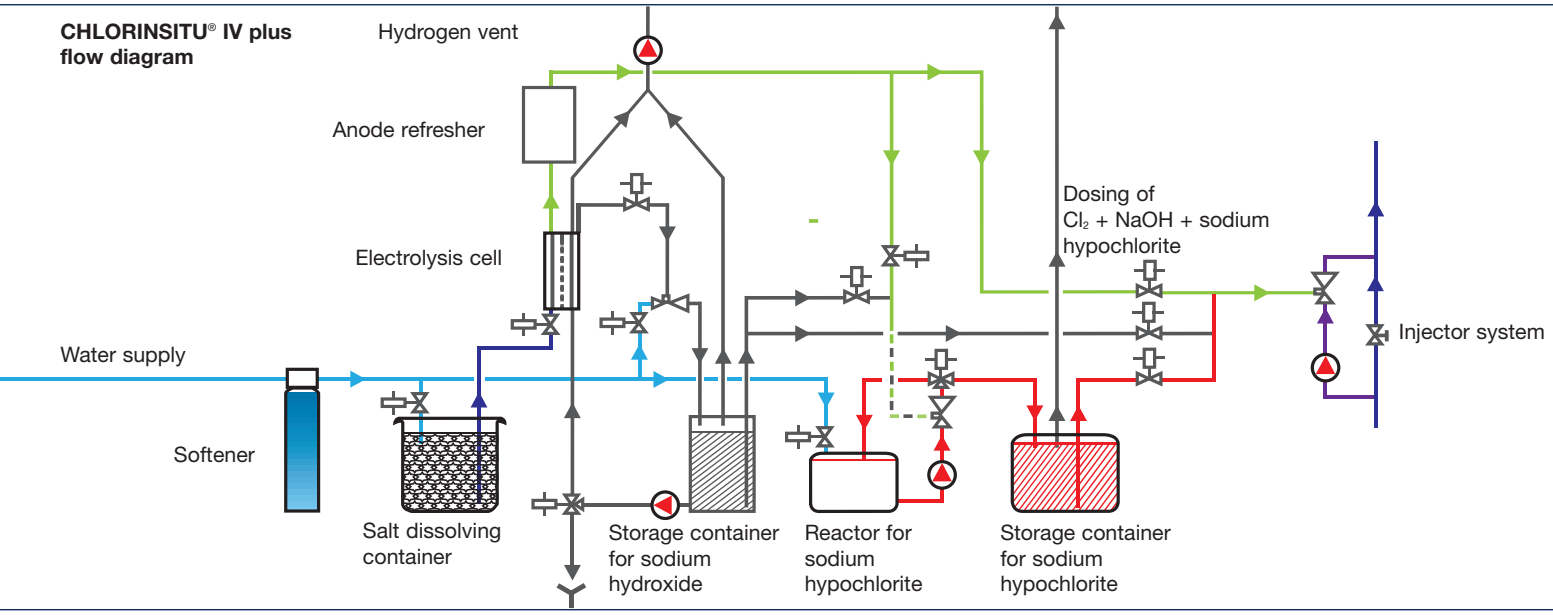
Systems with an output of > 50 g/h and an integral dosing system have all of the requisite equipment, such as pressure increasing pumps and injectors, perfectly coordinated to each other and ready-fitted within the system. System storage tanks, intended to temporarily store sodium hypochlorite, must be fitted on site. All level sensors for regulating the filling level are included with the system.

Tailor-made solutions
All standard models can be adapted to meet specific customer requirements. Therefore, almost any number of dosing points for chlorine, sodium hypochlorite or sodium hydroxide can be achieved.

Further information:
www.promaqua.com/electrolysis

Our Extensive Range for Individual Solutions

CHLORINSITU® IV plus flow diagram



Application features

Generation and temporary storage of sodium hypochlorite. Dosing through separate dosing pumps:
CHLORINSITU® II und III

Generation and dosing of hypochlorous acid and sodium hydroxide for pH adjustment with integral dosing system:
CHLORINSITU® IV und IV compact

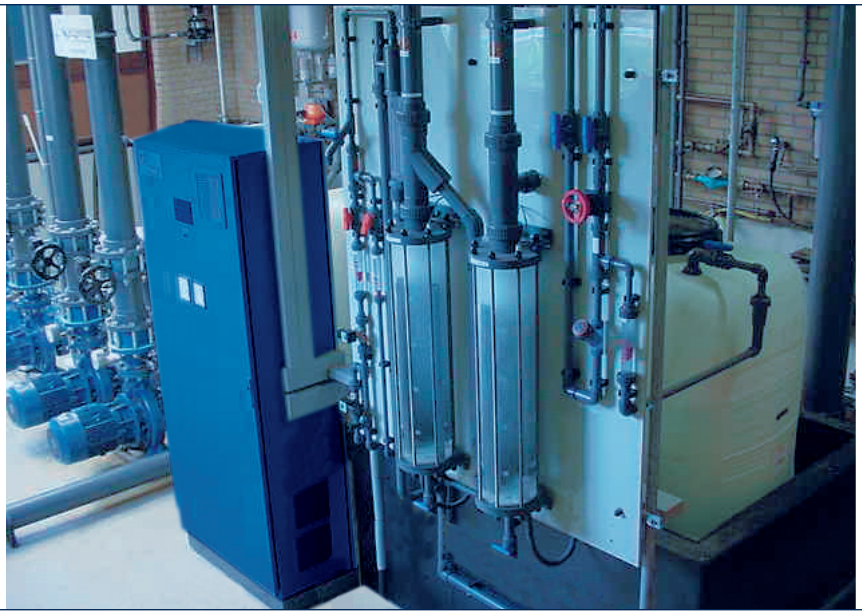
Generation and dosing of hypochlorous acid and temporarily stored sodium hypochlorite and sodium hydroxide for pH adjustment with integral dosing system:
CHLORINSITU® IV plus

Type	Technology	Disinfectant	Output [g/h]	Integral dosing system	Integral pH correction
CHLORINSITU® II	Tubular cell electrolysis	Sodium hypochlorite	50 – 1,600	no	no
CHLORINSITU® III	Membrane electrolysis	Sodium hypochlorite	50 – 3,500	no	no
CHLORINSITU® IV	Membrane electrolysis	Hypochlorous acid	100 – 3,500	yes	yes
CHLORINSITU® IV compact	Membrane electrolysis	Hypochlorous acid	25 - 50	yes	optional
CHLORINSITU® IV plus	Membrane electrolysis	Hypochlorous acid + sodium hypochlorite	100 – 3,500	yes	yes

Further information:
www.promaqua.com/electrolysis

Tubular Cell Electrolysis Systems CHLORINSITU® II

Robust Technology



The CHLORINSITU® II range of electrolysis systems generates sodium hypochlorite with a concentration of 5 g/l. Our systems are especially suitable for applications where a robust and clearly understandable technology is required and where it is unproblematic if sodium chloride ends up in the water to be treated.

- Simple generation and temporary storage of diluted sodium hypochlorite solution
- No handling of hazardous chemicals
- Robust, simple technology
- Compact, space-saving design
- Reliable system control with remote diagnosis by modem

Type/ Output g/h	Voltage supply	Power consumption kW	Salt consumption kg/h	Process water consumption l/h	Cooling water consumption l/h	Dimensions L x W x H mm	Brine tank l	Recommended volume of storage tank l
50	3 x 400 V	0.78	0.2	11	–	1,050 x 600 x 1,550	80	300
100	3 x 400 V	1.15	0.4	22	–	1,050 x 600 x 1,550	80	500
150	3 x 400 V	1.53	0.6	32	–	1,050 x 600 x 1,550	200	700
200	3 x 400 V	1.90	0.8	43	–	1,050 x 600 x 1,550	200	1000
300	3 x 400 V	2.65	1.1	65	–	1,050 x 600 x 1,550	200	1500
400	3 x 400 V	3.40	1.5	86	–	1,500 x 800 x 2,000	200	2000
500	3 x 400 V	4.15	1.9	108	–	1,500 x 800 x 2,000	380	2500
600	3 x 400 V	4.90	2.3	129	–	1,500 x 800 x 2,000	380	3000
800	3 x 400 V	6.40	3.0	172	–	1,500 x 800 x 2,000	380	3500
1000	3 x 400 V	7.90	3.8	215	–	1,500 x 800 x 2,000	520	4500
1200	3 x 400 V	9.40	4.6	258	–	1,500 x 800 x 2,000	520	5500
1400	3 x 400 V	10.90	5.3	301	–	1,500 x 800 x 2,000	520	6000
1600	3 x 400 V	12.40	6.1	344	–	1,500 x 800 x 2,000	520	7000

Further information:
www.promaqua.com/electrolysis

Membrane Electrolysis Systems CHLORINSITU® III

Low-Chloride Sodium Hypochlorite

The CHLORINSITU® III range of electrolysis systems generates sodium hypochlorite with a concentration of 20-25 g/l without any significant leakage of sodium chloride from the electrolysis cell into the finished product. The pH value of the water being treated is affected substantially less than when conventional sodium hypochlorite is used (pH 12-13.5) owing to the moderate pH value (approx. 9). The result is a significantly lower quantity of chemicals needed to adjust the water's pH value.
The sodium hypochlorite generated is temporarily stored in a storage tank and can be dosed from there. Our systems have been designed to generate a high output with low energy consumption and the lowest possible production of by-products.

- Simple generation and temporary storage of concentrated and low-chloride sodium hypochlorite solution
- Minimal effect on the pH value of the water to be treated
- Cost-effective operation thanks to high salt yield and low energy consumption
- No handling of hazardous chemicals
- Compact, space-saving design
- Reliable system control with remote diagnosis by modem

Type/ output g/h	Voltage supply	Power consumption kW	Salt consumption kg/h	Process water consumption l/h	Cooling water consumption l/h	Dimensions L x W x H mm	Brine tank l	Recommended volume of storage tank l
50	3 x 400 V	0.90	0.1	2.4	–	1,250 x 600 x 1,550	80	100
75	3 x 400 V	1.00	0.2	3.6	–	1,250 x 600 x 1,550	80	100
100	3 x 400 V	1.10	0.2	4.8	–	1,250 x 600 x 1,550	80	200
200	3 x 400 V	1.50	0.4	9.7	–	1,250 x 600 x 1,550	80	300
300	3 x 400 V	1.90	0.6	15	100	1,250 x 600 x 1,550	200	400
400	3 x 400 V	2.30	0.8	19	100	1,250 x 600 x 1,550	200	500
500	3 x 400 V	2.70	1.1	24	100	1,250 x 600 x 1,550	200	600
600	3 x 400 V	3.10	1.3	29	100	1,250 x 600 x 1,550	200	700
1000	3 x 400 V	4.70	2.1	48	100	1,700 x 600 x 2,000	380	1200
1500	3 x 400 V	6.70	3.2	73	100	1,700 x 600 x 2,000	380	1800
2000	3 x 400 V	8.70	4.2	97	200	1,800 x 1,200 x 2,000	520	2500
2500	3 x 400 V	10.70	5.3	121	200	1,800 x 1,200 x 2,000	520	3000
3000	3 x 400 V	12.70	6.3	145	200	2,300 x 600 x 2,000	520	3300
3500	3 x 400 V	14.70	7.4	169	200	2,300 x 600 x 2,000	520	4000

Further information:
www.promaqua.com/electrolysis

Membrane Electrolysis Systems CHLORINSITU® IV

Low-Chloride Disinfection with pH Correction

The CHLORINSITU® IV range of electrolysis systems generates ultra-pure chlorine gas in a vacuum process that is immediately and safely dissolved in water within the system as hypochlorous acid. The chloride-free sodium hydroxide is temporarily stored and can be transferred into the water through the same injector to correct the pH value. Our system operates in batch mode to optimise salt and energy consumption and is particularly suitable for applications in which there is no need for chlorine to be continuously dosed.

- Robust technology
- Compact, space-saving design
- Safe vacuum pressure technology
- Generation and dosing of ultra-pure hypochlorous acid and sodium hydroxide
- Chlorination and pH adjustment with one system
- No handling of hazardous chemicals

Type/ Output g/h	Voltage supply	Power consum-ption kW	Salt - consum ption kg/h	Process water consum-ption l/h	Cooling water consumption l/h	Dimensions L x W x H mm	Brine tank l	Recommended volume of storage tank l
100	230 V	1.10	0.2	0.8	–	1,050 x 600 x 1,550	80	–
150	3 x 400 V	1.30	0.3	1.3	–	1,050 x 600 x 1,550	80	–
200	3 x 400 V	1.50	0.4	1.7	–	1,050 x 600 x 1,550	200	–
300	3 x 400 V	1.90	0.6	2.5	–	1,050 x 600 x 1,550	200	–
400	3 x 400 V	2.30	0.8	3.4	–	1,050 x 600 x 1,550	200	–
500	3 x 400 V	2.70	1.1	4.2	–	1,050 x 600 x 1,550	200	–
600	3 x 400 V	3.10	1.3	5	–	1,050 x 600 x 1,550	200	–
750	3 x 400 V	3.70	1.6	6.3	–	1,500 x 600 x 2,000	380	–
1000	3 x 400 V	4.70	2.1	8.4	–	1,500 x 600 x 2,000	380	–
1250	3 x 400 V	5.70	2.6	11	–	1,500 x 600 x 2,000	380	–
1500	3 x 400 V	6.70	3.2	13	–	1,500 x 600 x 2,000	380	–
1750	3 x 400 V	7.70	3.7	15	–	1,500 x 600 x 2,000	380	–
2000	3 x 400 V	8.70	4.2	17	200	2,300 x 600 x 2,000	520	–
2500	3 x 400 V	10.70	5.3	21	200	2,300 x 600 x 2,000	520	–
3000	3 x 400 V	12.70	6.3	25	200	2,300 x 600 x 2,000	520	–
3500	3 x 400 V	14.70	7.4	29	200	2,300 x 600 x 2,000	520	–

Further information:
www.promaqua.com/electrolysis

Membrane Electrolysis Systems CHLORINSITU® IV compact

High-Quality Solutions for Smaller Applications

The CHLORINSITU® IV compact range of electrolysis systems generates ultra-pure chlorine gas in a vacuum process that can immediately and safely be dissolved in water within the system as hypochlorous acid. Thanks to the membrane technology used, the sodium hydroxide generated can be collected separately and optionally used to adjust the ph value. The dosing pump needed for this is already fitted on the inside of the system. Electrolysis takes place continuously, allowing for continuous dosing. Our system is specifically designed for smaller applications in private homes or hotels and stands out on account of its easily understandable and simple operating system.

- Robust, simple technology
- Compact, space-saving design
- Excellent water quality thanks to a high-performing active agent
- Disinfection of water and ph adjustment with one system
- No handling of hazardous chemicals
- Safe vacuum pressure technology
- Simple and safe operation

Type/ Output g/h	Voltage supply	Power consum-ption kW	Salt consum-ption g/h	Process water consum-ption l/h	Dimensions L x W x H mm	Brine tank l
25	230 V/50 Hz	0.11	65	1.5	575 x 355 x 650	120
50	230 V/50 Hz	0.22	131	3	575 x 355 x 650	120

Further information:
www.promaqua.com/electrolysis

Membrane Electrolysis Systems CHLORINSITU® IV plus

Low-Chloride Disinfection with pH Correction

The CHLORINSITU® IV plus range of electrolysis systems generates ultra-pure chlorine gas in a vacuum process that is immediately and safely dissolved in water within the system as hypochlorous acid. The chloride-free sodium hydroxide is temporarily stored and can be used to correct the ph value of the water. At the same time, excess chlorine gas is bound with sodium hydroxide, temporarily stored as sodium hypochlorite and used to cover demand peaks. Therefore, the system need not be designed to meet its maximum chlorine demand but can be designed to meet its average daily requirements. All three chemicals are dosed through a common injector system that can also be extended to incorporate several dosing points. Our system is therefore especially suitable for swimming pool applications where several pools can be simultaneously fed by the same electrolysis system.

- Robust, simple technology
- Compact, space-saving design
- Excellent water quality with a high-performing active agent
- Disinfection of water and ph adjustment with one system
- No handling of hazardous chemicals
- Safe vacuum pressure technology
- Simple and reliable operating system

Type/ Output g/h	Voltage supply	Power consum-ption kW	Salt - consum ption kg/h	Process water consum-ption* l/h	Cooling water consumption l/h	Dimensions L x W x H mm	Brine tank l	Recommended volume of storage tank l
100	230 V	1.10	0.2	11	–	1,050 x 600 x 1,550**	80	150
150	3 x 400 V	1.30	0.3	16	–	1,050 x 600 x 1,550**	80	200
200	3 x 400 V	1.50	0.4	22	–	1,050 x 600 x 1,550**	200	250
300	3 x 400 V	1.90	0.6	33	–	1,050 x 600 x 1,550**	200	400
400	3 x 400 V	2.30	0.8	43	–	1,050 x 600 x 1,550**	200	500
500	3 x 400 V	2.70	1.1	54	–	1,050 x 600 x 1,550**	200	600
600	3 x 400 V	3.10	1.3	65	–	1,050 x 600 x 1,550**	200	700
750	3 x 400 V	3.70	1.6	81	–	1,500 x 600 x 2,000***	380	850
1000	3 x 400 V	4.70	2.1	108	–	1,500 x 600 x 2,000***	380	1,100
1250	3 x 400 V	5.70	2.6	136	–	1,500 x 600 x 2,000***	380	1,400
1500	3 x 400 V	6.70	3.2	163	–	1,500 x 600 x 2,000***	380	1,700
1750	3 x 400 V	7.70	3.7	190	–	1,500 x 600 x 2,000***	380	2,000
2000	3 x 400 V	8.70	4.2	217	200	2,300 x 600 x 2,000***	520	2,200
2500	3 x 400 V	10.70	5.3	271	200	2,300 x 600 x 2,000***	520	2,800
3000	3 x 400 V	12.70	6.3	325	200	2,300 x 600 x 2,000***	520	3,300
3500	3 x 400 V	14.70	7.4	379	200	2,300 x 600 x 2,000***	520	3,900

* The process water consumption depends on the ratio of chlorine gas to reserve production. The value is given here for a ratio of 50 % : 50 %.
** + 800 x 600 x 1,550
*** + 1,200 x 600 x 2,000

Further information:
www.promaqua.com/electrolysis

A Practical Example - De Mirandabad, Amsterdam

Safe Swimming Pool Water Treatment

“Our swimmers clearly notice the difference from other swimming pools – no unpleasant chlorine odour, no burning eyes, no irritation of the skin or airways. We disinfect in an especially environmentally-friendly manner using a modern water treatment system. Thanks to its simple operation and use of salt, completely reliable and harmless operation is guaranteed.”
René Versloot. Director of De Mirandabad

The “De Mirandabad” is one of the largest swimming pools in the Netherlands. The glazed dome, which spans the wave pool, whirlpools and slides, is quite unique. Over and above the 25-metre indoor pool, there are three outdoor pools, a 50-metre pool, toddler pool and a hexagonal plunge pool for an unforgettable swimming experience.

The Challenge

- Water disinfection that is safe for guests and the environment
- Low operating costs
- Improved water quality

The Solution

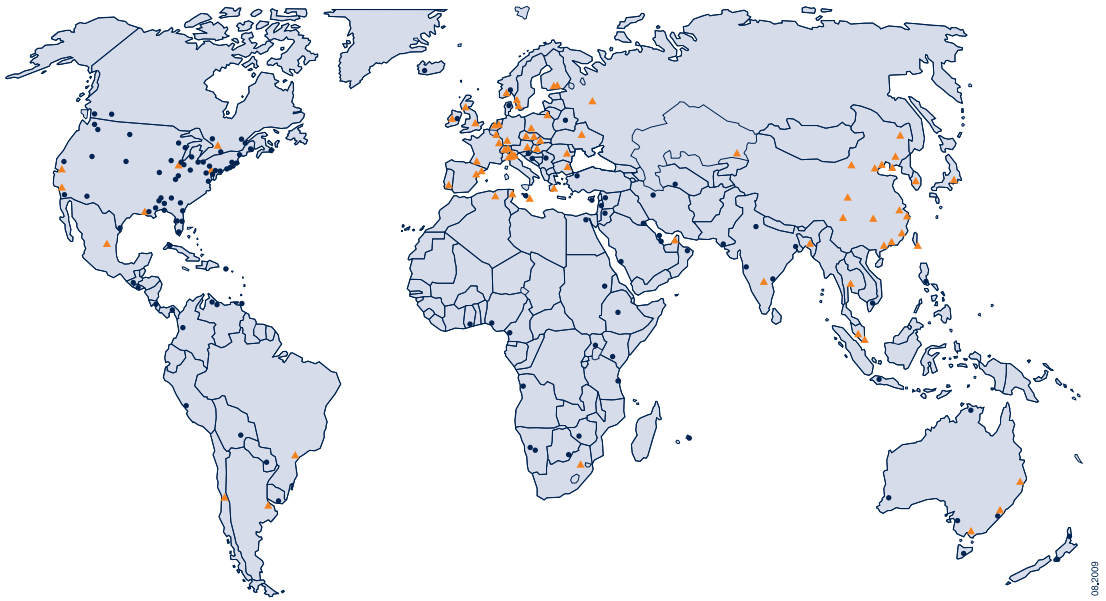
- Development of a safe and convenient complete solution
- A water treatment and disinfection system that simply provides exceptional disinfection and ph adjustment
- Use of the CHLORINSITU® IV plus electrolysis system

Benefits for the Customer

- Operating reliability due to optimum disinfection with a tailored electrolysis system
- Improved cost-effectiveness, thanks to high levels of customer satisfaction and low operating costs

Further information:
www.promaqua.com/practicalexample

World-Wide Contact



ProMaqua is a member of the ProMinent group of companies and is represented in more than 100 countries of the world. This guarantees a world-wide availability of the products and short distances to the customer. All over the world, we offer identical quality standards for products and services. For you at site: Experience and know-how in water treatment and metering technology.

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