

EN ISO 9001 : 2008
EN ISO 14001 : 2009

TUV NORD



WATER TREATMENT

ACTIVITY

AQUA INTERMA INŽENJERING offers a wide variety of devices, installations and equipment for dosing of chemicals and water disinfection, both in the potable water production systems and in the industrial and waste water treatment systems.

Product range of our company includes products, equipment and systems for gas chlorination, dosing systems for sodium hypochlorite and other chemicals, measurement, neutralization of chlorine in the air, and automatic control of the production process and water disinfection.

Having aspiration after constant development and sophistication, we keep establishing cooperation with highly regarded world manufacturers of installations and equipment for water treatment, transportation and handling of fluids so that we are perfectly qualified to offer to the market superior systems and equipment.



In addition to the activities in the domain of production, **AQUA INTERMA INŽENJERING** disposes of strongly developed service facilities with qualified professional personnel. Our service team is ready for quick response at the client's call and is qualified to solve all possible problems relative to the equipment performance, not only of our own but of other manufacturers as well.

AQUA INTERMA INŽENJERING, at own store, disposes at any time of sufficient count of finished products and spare parts for immediate supply and quick intervention in the event of failure at own equipment and of other manufacturers.

For over 15 years company's main focus is on quality of products, continuously making efforts to improve quality. To fulfill quality assurance in design, development, production, installation, and servicing in water treatment technology, Quality Management System ISO 9001 and ISO 14001 standards are implemented and certified by TUV NORD. All produced and serviced products are going through final inspection tests to issue quality certificate.

AQUA INTERMA INŽENJERING

- Development and Production
- Assembly
- Service

Equipment for measurement, dosing, disinfection, fluid transportation and devices for neutralization of chlorine in the air.

- Chlorine gas systems and devices



- Sodium hypochlorite dosing systems



- Automatic control and regulation of the dosing and disinfection process.



- Chlorine neutralization systems



ACTIVITY

CHLORINATION

Company AQUA INTERMA INŽENJERING has the basic activities in domain of production, assembling and servicing equipment for measurement, dosing, chlorination and neutralization of chlorine in the air. Our product range includes equipment for gas chlorination, as well as sodium hypochlorite (or some chlorine compound) dosing systems. High quality devices for dosing, measuring and control are produced based on long experience in the field of water treatment technology.



Production, transport and distribution of water would be unthinkable without usage of chlorine (or some chlorine compounds). In the water supply facilities, process of water treatment, besides other chemical treatment, including chlorine feed, as the commonly chemical disinfectant. Water chlorination process can be performed as chlorine (Cl_2) gas feed or chlorine dosing system, with some of chlorine compounds. After chlorination, one part of supplied chlorine will be spent in biochemical process and the other part remains in water distributed to the population (residual chlorine). During distribution, water remains disinfected by means of this residual chlorine, preventing appearance of bacteria, microorganisms and viruses. Without chlorination the distribution network would be limited in length and may result in the spread of dangerous and infectious diseases.

WATER TREATMENT

Besides activities in the field of drinking water purification and disinfection, AQUA INTERMA INŽENJERING is also present in domain of water treatment for various assignments, in the municipal water supply, industrial systems, as well as in public institutions, sports centers etc. Depending on requests for water quality and water usage assignment, there is a multitude of different concepts and ways of water disinfection and water treatment.

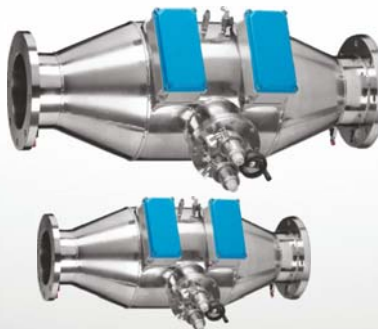
WATER DISINFECTION IN PRIVATE AND PUBLIC SWIMMING POOLS

AQUA INTERMA INŽENJERING offers safe and reliable methods of swimming pool disinfection, ensuring healthy conditions in private, public indoor and outdoor swimming pools, and also in hotel swimming complexes with many separate pools etc. Present time brings modern and new technology demands for water quality in swimming, recreational and private pools and spas. With implementation of various approved new technologies, based on disinfection with silver and copper ions and other compounds, we are achieving excellent results and water quality.



UV DISINFECTION

Ultraviolet water disinfection is an effective way to fight all bacteria, spores and viruses including pathogens that are resistant to chlorine. This process is a purely physical, and chemical-free. UV-C radiation initiates a photochemical reaction that destroys the genetic information contained in the microorganisms DNA. Disinfection using UV light is quick and clean and no bacteria or viruse are immune to it. UV is an optimal solution which can be applied from sewage water to potable water with wide range of capacity.



ACTIVITY

WATER FILTRATION

Depending on raw water quality, implemented technology and industrial applications, various filter media and methods of filtration can be applied. According to the filtration method, produced water can be used as drinking water or ultra purified water for industrial, pharmaceutical and medical applications. To meet these needs many different methods of filtration can be applied: mechanical filtration, microfiltration, ultrafiltration, nanofiltration and reverse osmosis.



AQUA INTERMA INŽENJERING applied all mentioned technologies and has extensive experience in selecting proper filter material for every application. The production program of our company includes design, manufacture and commissioning of standard filtration systems to suit the requirements of all input parameters of row water.



PRODUCTION OF SODIUM HYPOCHLORITE FROM SALT

Equipment for on-site production of sodium hypochlorite from salt allows the application of disinfectant in the place of consumption, avoiding the need for its storage. These devices have emerged as an alternative to conventional systems for dosing of sodium hypochlorite and other disinfectants. As a rule, and recommended by manufacturers, this equipment is used for closed systems with a constant chlorine consumption and with slow changes of dosing rate so the production can follow fluctuation.



According to the principle these systems can be classified into two groups: tubular cell electrolysis and membrane electrolysis. Tubular cell electrolysis takes place in a common chamber containing two electrodes, while the membrane electrolysis system takes place in two chambers with electrodes separate with membrane.

Devices designed for sodium hypochlorite and chlorine gas production from salt, are particularly suitable for swimming pools and for small industrial water systems.

Concentration of produced hypochlorite is about 0,5-1,15% of active chlorine, which is ten times lower concentration, compared with commercial product. Production capacity of these systems are limited and previously presented to each user, as well as power consumption, which is significant.

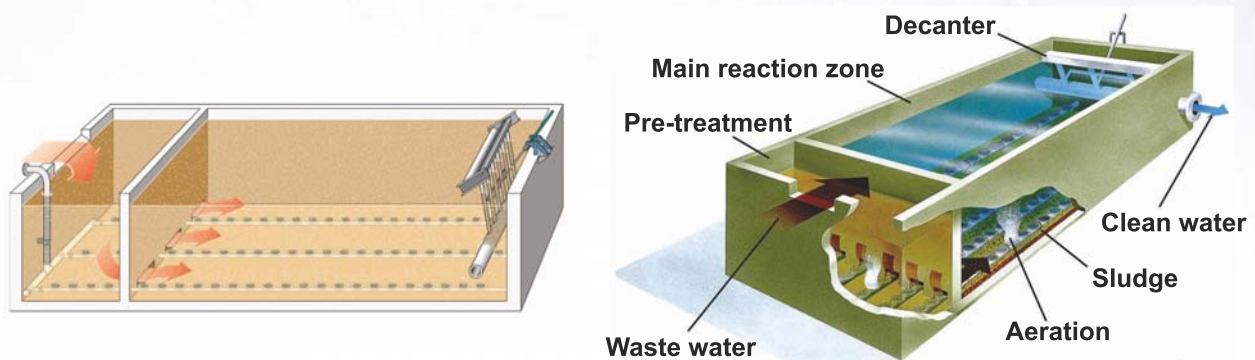


ACTIVITY

WASTE WATER TREATMENT

Waste water treatment is carried out using the SBR (Sequencing Batch Reactor) technology with a continuous water inflow. In addition to high efficiency, advantage of such systems is also reflected in a simplified design, without need for separate sedimentation tank. Bio-reactor is, at the same time, used as a settler in process of biomass accumulation and also for aeration process.

One more advantage of SBR technology over conventional system of wastewater treatment is continuous waste water inflow during the process of aeration, settling and decantation. There is also a possibility of receiving the inflow up to 6 times higher than the average.



Expansion of these systems is simple, by construction of new bio-reactors. The very principle of operation and maintenance of the system is simplified. Minimum space is required for construction with minimal power consumption and investments.

Built waste water treatment plants are working very effectively, keeping the processing program simple and, at the same time, the results achieved are under regulation of wastewater quality without performing tertiary treatment to allow rejection into ecosystem.



PILOT PLANTS

In addition to standard solutions in water treatment technology AQUA INTERMA INŽENJERING performs tests of various technological processes on pilot plants. Pilot Plants are used to obtain information about the behavior of the system, for potential use in larger installations.



Essence is to define the optimal production process related to the quality of raw water which finds the presence and concentration of certain contaminants. Empirically chosen filter materials, process control and continuous laboratory monitoring gives excellent results at the end of the pilot process.



ACTIVITY

COMPACT - PREFABRICATED PLANTS FOR DRINKING WATER PREPARATION



PROPERTIES OF TREATED WATER

Basic characteristics of raw water, which is processed with modern technology until it reach drinking water sandard, are divided by categories depending on key physical and chemical characteristics of raw water.

TYPES OF TREATMENT PLANTS

Types of treatment plants are categorized based on the row water characteristics for following plant capacities:

Capacity:	2l/s	4l/s	6l/s	8l/s
Population (approximately):	1.150	2.300	3.450	4.600

With a specific consumption of 150 l/user/day.

PREFABRICATED BUILDINGS FOR WATER TREATMENT EQUIPMENT

Prefabricated building and filtration plant with corresponding equipment is mounted and assembled on reinforced concrete plate. If necessary, all mentioned equipment can be removed and used in another location

SCOPE OF SUPPLY

- Advice in selecting the appropriate type of plant for certain raw water quality
- Delivery, transport, installation and commissioning of industrial equipment within the installation facility
- Delivery, transport and installation of prefabricated building on reinforced concrete plate

CATEGORY OF ROW WATER

Characteristics of raw water, which is treated on specific water treatment plant, include indicative parameters that do not comply with drinking water standards. On the basis of these parameters we can define the type of treatment plant, with capacity ranges 2-8 l/s. The starting point of orientation for certain type of plant and equipment is a complete analysis of raw water, which is the subject of treatment.

HYDROMECHANICAL, ELECTRICAL AND PROCESS EQUIPMENT DEFINED BY ROW WATER CATEGORY (UNDERGROUND - WELL WATER)

WATER CATEGORY

CATEGORY I

Odor: exist
Taste: exist, bad
Iron Fe: $\leq 3-4$ mg/l
Manganese Mn: $>0,05$ mg/l
Ammonia NH₄⁺: ≤ 2 mg/l
Arsenic As: $> 0,0$
Other limiting values are acceptable.

CATEGORY II (a)

Odor: exist
Taste: exist, bad
Iron Fe: $\leq 3-4$ mg/l
Manganese Mn: $>0,05$ mg/l
Ammonia NH₄⁺: ≤ 2 mg/l; ≤ 4 mg/l
Arsenic As: $> 0,0$
Other limiting values are acceptable.

CATEGORY II (b)

Odor: exist
Taste: exist, bad
Iron Fe: $\leq 3-4$ mg/l
Manganese Mn: $>0,05$ mg/l
Ammonia NH₄⁺: ≤ 2 mg/l; ≤ 4 mg/l
Other limiting values are acceptable.

CATEGORY II (c)

Odor: exist
Taste: exist, bad
Iron Fe: $\leq 4-5$ mg/l
Manganese Mn: $>0,05$ mg/l
Ammonia NH₄⁺: 5-6 mg/l
Arsenic As: $> 0,0$
Other limiting values are acceptable.

CATEGORY II (d)

Odor: exist
Taste: exist, bad
Iron Fe: ≤ 5 mg/l
Manganese Mn: $> 0,05$ mg/l
Ammonia NH₄⁺: up to 5-6 mg/l
Arsenic As: $> 0,0$
Other limiting values are acceptable.

CATEGORY III

Odor: exist
Taste: exist, bad
Colour: $\leq 80-100$ pt/Co
KMnO₄: $\leq 50-60$ mg/l
Iron Fe: $\leq 0,1$ mg/l
Manganese Mn: $> 0,05$ mg/l
Electric conductivity: $> 1000 \mu\text{S}/\text{cm}^{-1}$
Arsenic As: $> 0,0$
Sodium Na: >150 mg/l
Ammonia NH₄⁺: $\leq 2,5$ mg/l
Other limiting values are acceptable.

ACTIVITY

HYDROMECHANICAL, ELECTRICAL AND PROCESS EQUIPMENT

CATEGORY I

Cascade Aerator – degasser
Contact - retention tank
Filters, opened (single-stage filtration)
Pumps for filters washing
Disinfection unit
Internal pipelines
Electromotive valves
Internal power distribution
Automation, PLC
Prefabricated building mounted on the reinforced concrete plate

CATEGORY II (a)

Cascade Aerator – degasser
Contact - retention tank
Pumps on water supplying line
Optional: Fe-Sulphate dosing
Filters, closed (two-stage filtration)
Compressors on the process line
Pumps for filters washing
Disinfection unit
Internal pipelines
Electromotive valves
Internal power distribution
Automation, PLC
Prefabricated building mounted on the reinforced concrete plate

CATEGORY II (b)

Filters for “dry” filtration
Dry filters operating blowers
Pumps for filters washing
Blowers for filters washing
Disinfection unit
Internal pipelines
Electromotive valves
Internal power distribution
Automation, PLC
Prefabricated building mounted on the reinforced concrete plate

CATEGORY II

Filters, closed - in the first stage of filtration
Optional: Fe-Sulphate dosing
Filters “dry” - in the second stage of filtration
Compressors on the process line
Dry filters operating blowers
Pumps for filters washing
Disinfection unit
Internal pipelines
Electromotive valves
Internal power distribution
Automation, PLC
Prefabricated building mounted on the reinforced concrete plate

CATEGORY II (d)

Cascade Aerator – degasser
Contact - retention tank
Pumps on water supplying line
Optional: Fe-Sulphate dosing
Filters, closed - in the first stage of filtration
Filters “dry” - in the second stage of filtration
Dry filters operating blower
Pumps for filters washing
Blowers for filters washing
Disinfection unit
Internal pipelines
Electromotive valves
Internal power distribution
Automation, PLC
Prefabricated building mounted on the reinforced concrete plate

CATEGORY III

Cascade Aerator – degasser
Contact - retention tank
Pumps on water supplying line
Filters, closed (two-stage filtration)
Membrane (RO) Unit
pH correction Unit
Coagulant dosing Unit
Flocculant dosing Unit
Blowers on water supplying line
Pumps for filters washing
Blowers for filters washing
Disinfection unit
Internal pipelines
Electromotive valves
Internal power distribution
Automation, PLC
Prefabricated building mounted on the reinforced concrete plate

BASIC CHARACTERISTICS OF TECHNOLOGICAL PROCESSES

- Maximal use of micro-biological processes (reduction of NH_4^+ , NO_3^- , Mn-, Fe content)
- Lack of oxidation compounds, that can create a health harmful oxidation by-products in reaction with the dissolved organic matter in water.
- Maximal use of natural processes (aeration with the oxygen from air, degassing)
- Minimal presence of mechanical equipment
- PLC support of the treatment processes
- Easy operation and maintenance
- Use of materials that can be recycled
- All these processes are proven on pilot plants or in exploitation

PLANT CAPACITY		CATEGORY I				CATEGORY II a				CATEGORY II b				
		2	4	6	8	2	4	6	8	2	4	6	8	
PREFABRICATED OBJECTS DIMENSIONS	FILTER STATION	Q, (l/s)	2,44	3,10	3,45	3,76	3,0	3,8	4,0	4,25	2,40	3,25	3,64	4,00
	CHEMICAL DOSING	B, (m)	5,37	6,58	7,69	8,26	5,91	9,71	11,08	12,50	6,50	7,50	9,30	10,00
		L, (m)	6,70	6,70	6,70	6,70	5,30	5,30	5,30	5,30	5,00	5,00	5,00	5,00
		H, (m)												
ARMoured CONCRETE PLATE DIMENSIONS	R.O. UNIT	B, (m)												
		L, (m)												
		H, (m)												
TANK FOR FILTER WASHING	R.O. UNIT	B, (m)	3,64	4,30	4,65	4,96	4,20	5,00	5,20	5,45	3,60	4,45	4,84	5,20
		L, (m)	6,57	7,78	8,89	9,46	7,11	10,91	12,28	13,70	7,70	8,70	10,50	11,20
		B, (m)												
		L, (m)												
SETTLING TANK FOR WASTE WATER FILTER WASHING	TANK FOR FILTER WASHING	V, (m ³)	10	20	30	40	20	40	60	80	30	60	90	120
		V, (m ³)	20	40	60	80	40	80	120	160	60	120	180	240
		B, (m)	2x1,70	2x2,40	2x2,90	2x3,40	2x2,30	2x3,40	2x4,15	2x4,8	2x2,93	2x4,14	2x5,07	2x5,86
		L, (m)	4,25	6,00	7,30	8,50	5,80	8,50	10,40	12,00	7,33	10,35	12,68	14,65
		H, (m)	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40

PLANT CAPACITY		CATEGORY II c				CATEGORY II d				CATEGORY III				
		2	4	6	8	2	4	6	8	2	4	6	8	
PREFABRICATED OBJECTS DIMENSIONS	FILTER STATION	Q, (l/s)	2,40	3,25	4,00	4,50	2,40	3,80	4,00	4,50	2,40	3,90	4,20	4,50
	CHEMICAL DOSING	B, (m)	9,22	12,00	13,33	14,44	11,50	14,50	16,00	17,50	8,40	10,32	11,92	13,32
		L, (m)	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00
		H, (m)												
ARMoured CONCRETE PLATE DIMENSIONS	R.O. UNIT	B, (m)												
		L, (m)												
		H, (m)												
TANK FOR FILTER WASHING	R.O. UNIT	B, (m)	3,60	4,45	5,20	5,70	3,60	5,00	5,20	5,70	3,60	5,10	5,40	5,70
		L, (m)	10,42	13,20	14,53	15,64	10,42	15,70	17,20	18,70	9,60	11,52	13,12	14,52
		B, (m)												
		L, (m)												
SETTLING TANK FOR WASTE WATER FILTER WASHING	TANK FOR FILTER WASHING	V, (m ³)	30	60	90	120	30	60	90	120	30	60	75	100
		V, (m ³)	60	120	180	240	60	120	180	240	60	120	150	200
		B, (m)	2x2,93	2x4,14	2x5,07	2x5,86	2x2,93	2x4,14	2x5,07	2x5,86	2x2,93	2x4,14	2x4,63	2x5,35
		L, (m)	7,33	10,35	12,68	14,65	7,33	10,35	12,68	14,65	7,33	10,35	11,58	13,38
		H, (m)	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40

VACUUM REGULATOR

VACUUM REGULATOR



Vacuum regulator operates on contemporary indirect vacuum principle and conforms to all YU safety principles and DIN 19606 standard. Proven, robust construction, high quality of built-in materials and constant production control allows safe operation under all operating conditions. Modularity of design and wide range of operating capacities meets all user requirements and provides a compatibility with the existing systems. The device has a visual indication of empty chlorine cylinder. It is manufactured in capacity range from 10 g/h up to 20 kg/h, depending on the user demands, with or without dosing valve.



VACUUM REGULATOR



GENERAL CHARACTERISTICS:

- ABS plastic housing
- Chlorine resistant membranes and springs
- Chlorine resistant valve needle and seat
- Corrosion resistant connecting assembly
- Gas flow indicator
- Indication of chlorine cylinder status "full-empty"
- Safety vent
- Easy installation on the chlorine bottle, chlorine container or manifold

WITHOUT DOSING VALVE		WITH DOSING VALVE	
Type	Capacity	Type	Capacity
H-02-09	up to 200 g/h	HD-02-09	up to 200 g/h
H-2-09	up to 2 kg/h	HD-2-09	up to 2 kg/h
H-4-09	up to 4 kg/h	HD-4-09	up to 4 kg/h
H-10-09	up to 10 kg/h	HD-10-09	up to 10 kg/h
H-20	up to 20 kg/h	HD-20	up to 20 kg/h



up to 4 kg/h



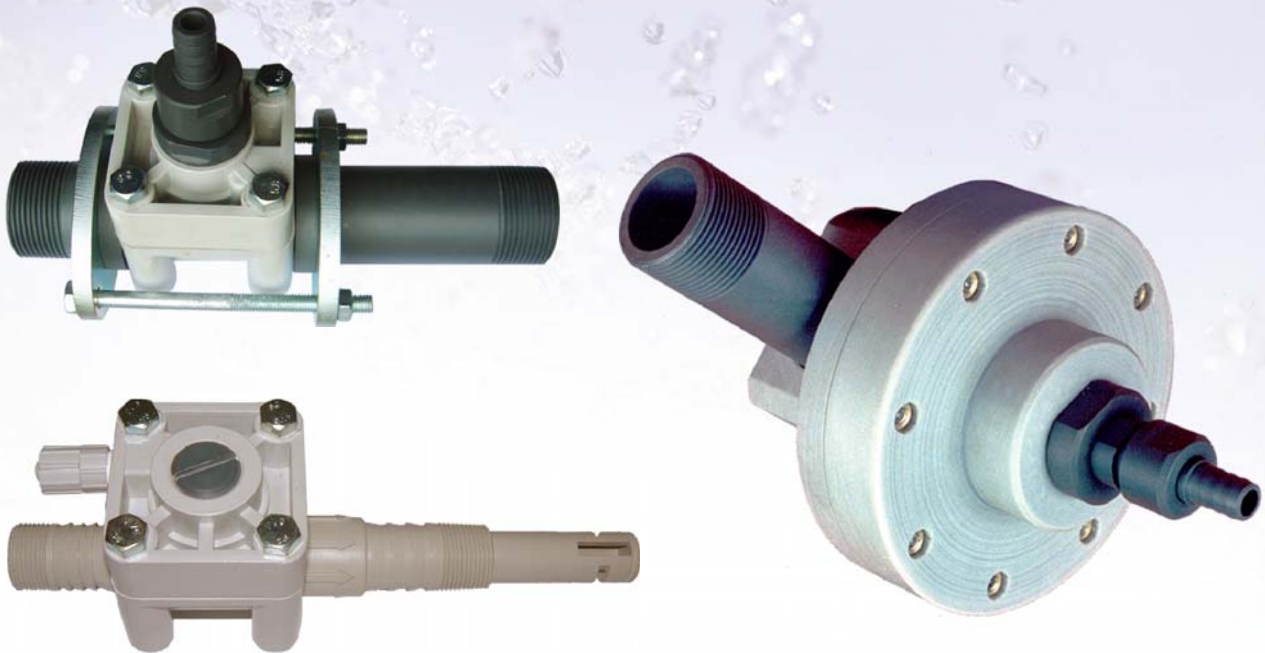
up to 10 kg/h



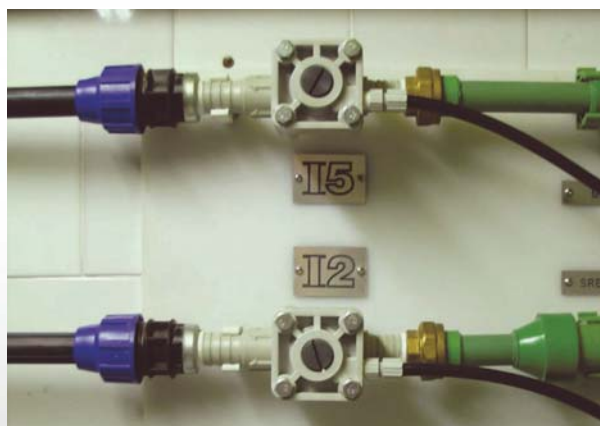
up to 20 kg/h

INJECTOR

INJECTOR



Feed water, needed for injectors operation, is supplied by buster pump and conducted through the injectors venturi tube. Inside of this tube feed water energy is transformed, creating the low pressure zone (vacuum) inside of suction chamber. The size of vacuum depends on pump pressure and nozzle size. Generated vacuum opens injector's non-return valve and draws chlorine gas from the vacuum installation. Injector is equipped with built-in non-return valve which prevents feed water penetration into the vacuum installation. This valve closes if there is a decrease of the vacuum value or at the moment of system standstill. It is recommended to install the injector directly at dosing point. Upon user request it is made in capacities up to 20 kg/h.



INJECTOR



CHARACTERISTICS:

- Made of chlorine resistant materials
- Chlorine resistant membranes and springs
- Non-return valve



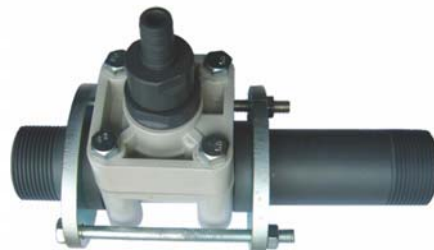
up to 4 kg/h



up to 4 kg/h



up to 4 kg/h



up to 10 kg/h



up to 20 kg/h

CONNECTIONS:

TYPE	INLET	OUTLET
I-4	3/4 "	3/4 "
I-4VP	3/4 " i 5/4 "	3/4 " i 5/4 "
I-10	5/4 "	5/4 "
I-20	5/4 "	5/4 "

ROTAMETER

ROTAMETER



Rotameter is most commonly used device for flow measurement. Great representation of this device is the result of its simplicity, wide range of applications and large measurement range.

The measuring tube has a variable cross-section, closest at the entrance of the tube, and widest at the exit of the tube. Fluid (in this case, chlorine gas) flows through the ring between the measuring tube and ball, and depending on the gas flow, ball is lifted to a certain height. They are made in capacities up to 20 kg/h.



ROTAMETER



CHARACTERISTICS:

- Made of chlorine resistant materials
- Chlorine resistant dosing valve needle and seat
- Connections for vacuum hose
- High measuring accuracy

CONNECTIONS:

CAPACITY	CONNECTION
up to 4 kg/h	vacuum hose D10/D7,5
up to 10 kg/h	vacuum hose D12,45/D9,35
up to 20 kg/h	vacuum hose D16/D11,5



up to 4 kg/h



up to 10 kg/h

up to 20 kg/h

VACUUM SWITCH

VACUUM SWITCH



Automatic vacuum switch works in semi-automatic and automatic systems with two chlorine cylinders and it is designed to secure uninterrupted operation and chlorine supply. Its design allows to switch over the chlorine supply from the second cylinder at the time of complete discharge of the first one. By doing so, not only a continuous feed, but a smooth exchange of empty tanks is secured. They are made in capacities up to 4 kg/h and up to 10 kg/h.



VACUUM SWITCH



CHARACTERISTICS:

- Made of chlorine resistant materials
- Autonomous operation with no need for external indicators and power supply
- Connections for vacuum hose

CONNECTIONS:

CAPACITY	CONNECTION
up to 4 kg/h	vacuum hose D10/D7,5
up to 10 kg/h	vacuum hose D12,45/D9,35

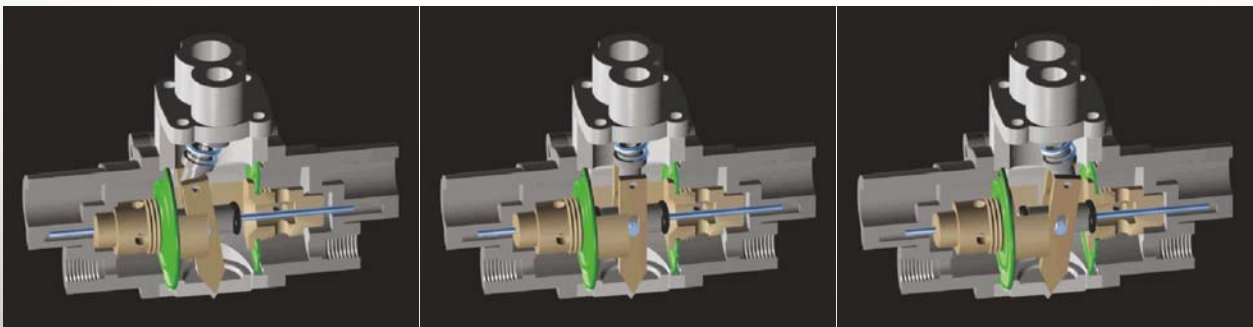


up to 4 kg/h



up to 10 kg/h

OPERATING PRINCIPLE OF VACUUM SWITCH



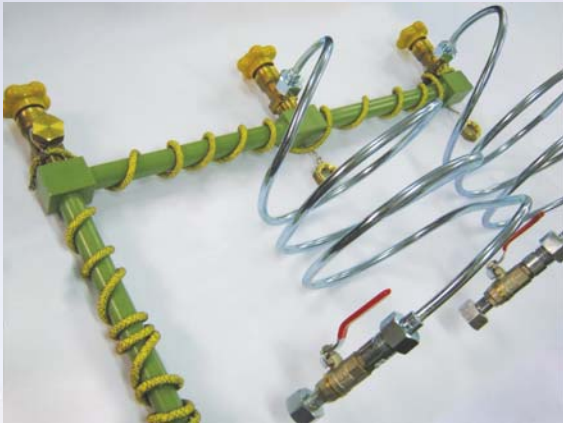
MANIFOLD

MANIFOLD



Manifold acts as the collecting line and it is used to connect 1, 2, 3, 4 or more chlorine cylinders and / or containers in the chlorination system. Its construction also provides easy separation of impurities, and also, by means of special heating elements, allows rapid transfer of liquid chlorine into the gaseous phase.





COMPONENTS:

- Chlorine valves
- Flexible tubes
- Ball valves 3 / 8"
- Manifold heater
- Wall brackets
- Pressure gauge (on request)

MANIFOLD CONNECTIONS:

CONNECTION	PURPOSE
G3/4"	Chlorine valve connection
W1"	Connection for flexible tube or chlorinator

TYPES:

ZV-1 - Manifold for 1 cylinder



ZV-4 - Manifold for 4 cylinders



ZV-2 - 2 Manifold for 2 cylinders



ZV-3 - 2 Manifold for 3 cylinders



CHLORINE VALVES

SHUT OFF VALVEL

Automatic "SHUT OFF" valve is the part of a system that is used to prevent effusion of chlorine gas from the cylinder or container. Closing of chlorine cylinders or containers with this valve can be performed manually or automatically, if the chlorine detector probe registers the presence of chlorine gas in the air. The valve is made of chlorine resistant materials.



Chlorine detector and "SHUT OFF" system have an independent power supply via UPS device. This design allows independent system operation in case of power failure, providing the additional safety in case of accident.

SOLENOID VALVE FOR CHLORINE



STANDARD CONNECTIONS:

CAPACITY	CONNECTION
up to 4 kg/h	vacuum hose D10/D7,5
up to 10 kg/h	vacuum hose D12,45/D9,35

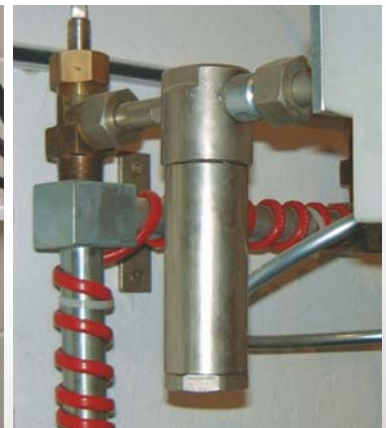
It is used in systems for semi-automatic operation. When the chlorination is performed in several distribution lines, each with its own pump, involvement of particular pumps activates the corresponding solenoid valves, thereby changing the chlorine dose.



CHLORINE FILTER



- Efficient separation of impurities
- Material protected against harmful effects of chlorine
- Installation between the vacuum regulator and chlorine valve
- Connections 1"



CHLORINE RESIDUAL ANALYZER AH-2003

CHLORINE RESIDUAL ANALYZER AH-2003



Chlorine residual analyzer AH-2003 has been tested and proven as a reliable device for continuous and accurate measurement of the residual. The device works on the amperometric principle and it is designed to continuously measure free chlorine in the water, swimming pools or in various process applications. The measuring cell is equipped with built-in continuous electrode hydraulic cleaning system with rotating balls, which eliminates signal interference and need for frequent analyzer recalibration. Integrated two-point alarm (high and low residual) is standard. Sample is brought through the control valve which eliminates the need for special sampling pumps. Gold and copper electrodes of large areas are used to obtain maximum signal strength. The device is made of anti-corrosive materials. Each unit is pre-assembled, requiring only the connection of sampling lines. Components and controls are available on the front panel enabling easy monitoring of the measured residual, sample flow rate, electrode cleaning system and adjustment of upper and lower alarm points.

CHLORINE RESIDUAL ANALYZER

AH-2003



CHARACTERISTICS:

- Continuous measurement
- High reliability
- High and low residual alarms
- Automatic electrode cleaning system
- Direct measurement of free chlorine
- Independent adjustment of lower and upper limits

ACCESSORIES:

- Pressure reducing valve
- Ball Valve
- Mechanical filter
- Rotameter

OPERATING PRINCIPLE

Water sample, with unknown chlorine content, is brought into the measuring cell. Using the amperometric method, the measuring cell generates an electrical signal proportional to the chlorine content. This signal is converted by the transmitter into a current signal 4-20 mA. Measured value is displayed on integrated digital display on the front panel, as well as on optional remote pointers, printers etc. Residual chlorine concentration can be regulated in the preset limits (built-in relay contacts are turned on at particular, preset minimum and maximum chlorine level).

TECHNICAL DATA:

- | | |
|---------------------------|--------------------------|
| - Measuring range *: | 0-1 mg/l Cl ₂ |
| - Sensitivity: | 0.01 mg/l (ppm) |
| - Linearity: | 1% |
| - Accuracy: | 2% |
| - Response time: | cca 60 seconds |
| - Sample flow: | cca 500 ml/min |
| - Sample connection: | flexible hose, Ø6/1mm |
| - Measuring method: | amperometric (Au/Cu) |
| - Display: | red LED, three digits |
| - Power supply: | 220V AC, 50Hz |
| - Power consumption: | <50mA |
| - Analog output signal: | 4 - 20mA |
| - Current-loop impedance: | 600Ω, max |
| - Alarm Relay Contacts: | 250V/2A, AC/DC |

* On special request, measuring range can be different, up to 10mg/l



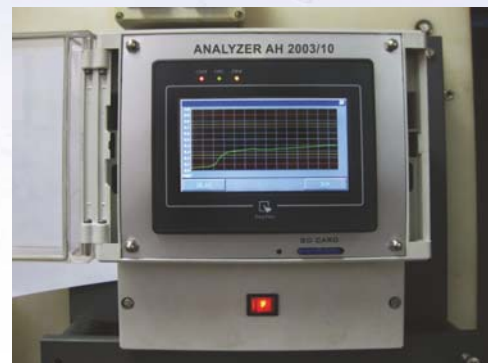
Residual Analyzer Electronics



Residual Analyzer Measuring Cell

CHLORINE RESIDUAL ANALYZER AH-2003/10

CHLORINE RESIDUAL ANALYZER AH-2003/10



Chlorine residual analyzer AH-2003/10 has been tested and proven as a reliable device for continuous and accurate measurement of the residual. The device works on the amperometric principle and it is designed to continuously measure free chlorine in the water, swimming pools or in various process applications. The measuring cell is equipped with built-in continuous electrode hydraulic cleaning system with rotating balls, which eliminates signal interference and need for frequent analyzer recalibration. Integrated two-point alarm (high and low residual) is standard. Sample is brought through the control valve which eliminates the need for special sampling pumps. Gold and copper electrodes of large areas are used to obtain maximum signal strength. The device is made of anti-corrosive materials. Each unit is pre-assembled, requiring only the connection of sampling lines. Components and controls are available on the front, 4.3" TOUCH SCREEN panel. This panel enables easy monitoring of measured residual and temperature, as well as upper and lower alarm point adjustment. All measured values are shown on integrated digital printer, and their record is made on the SD card in resolution requested by the user.

CHLORINE RESIDUAL ANALYZER

AH-2003/10



CHARACTERISTICS:

- Continuous measurement
- High reliability
- High and low residual alarms
- Automatic electrode cleaning system
- Direct measurement of free chlorine
- Independent adjustment of lower and upper limits

ACCESSORIES:

- Pressure reducing valve
- Ball Valve
- Mechanical filter
- Rotameter

OPERATING PRINCIPLE

Water sample, with unknown chlorine content, is brought into the measuring cell. Using the amperometric method, the measuring cell generates an electrical signal proportional to the chlorine content. This signal is converted by the transmitter into a current signal 4-20 mA. Measured value is displayed on the front Touch screen panel, as well as on integrated digital printer. Residual chlorine concentration can be regulated in the preset limits (built-in relay contacts are turned on at particular, preset minimum and maximum chlorine level).

Temperature probe is embedded within the measuring cell, and measured temperature value can also be read on the display and integrated digital printer.



Chlorine Residual Analyzer Electronic



Chlorine Residual Analyzer Cell

CHLORINE RESIDUAL ANALYZER

AH-2003/10

TECHNICAL DATA:

- Measuring range *: 0-1 mg/l Cl₂
- Sensitivity: 0.01 mg/l (ppm)
- Linearity: 1%
- Accuracy: 2%
- Response time: cca 60 seconds
- Sample flow: cca 500 ml/min
- Sample connection: flexible hose, Ø6/1mm
- Measuring method: amperometric (Au/Cu)
- Display: TFT touch screen panel 4.3 "
- Power supply: 220V AC, 50Hz
- Power consumption: <100mA
- Analog output signal: 4 - 20mA
- Current-loop impedance: 600Ω, max
- Alarm Relay Contacts: 2 programmable outputs 250V/6A, AC/DC
- 1 pulse input: for flow measurement through the cell (optional)
- 2 solid state digital outputs: for dosing pump controll (optional)

- 4 analog inputs 4-20 mA: Residual and temperature measurement
PH measurement (optional)
Redox measurement (optional)

- Communication port: RS485 MODBUS RTU communication interface,
ready for communication and remote data transfer
(optional RS232/Ethernet communication)

- Mini LCD display: for local readings of residual value (optional)

* On special request, measuring range can be different, up to 10mg/l



Measuring cell with mini LCD display for the local readings of chlorine residual and built-in temperature probe

CHLORINE RESIDUAL ANALYZER

AH-2003/10

Chlorine residual analyzer AH-2003/10 has integrated digital printer which enables graphical display of measured values, a total of 4 values (in standard version - residual chlorine and temperature, and optionally pH and Redox or other values, depending on user requirements). Graphical display of optional measurements (pH and redox) is not available if the option is not selected.



Each of the three measured values (residual, pH, Redox or other) is displayed on digital printer (with possible axis width from 3.5 minutes up to 14 hours) in function of temperature and with indication of alarm values.

All measured values are recorded on SD card with capacity up to 1GB (YYMMDD.CSV file, record resolution is 1 minute, or other, upon users request) Log file is created in standard industry comma separated value format.



The control interface is available in 6 languages: Serbian, English, German, Romanian, Slovenian, Hungarian (2 more languages are available on request)

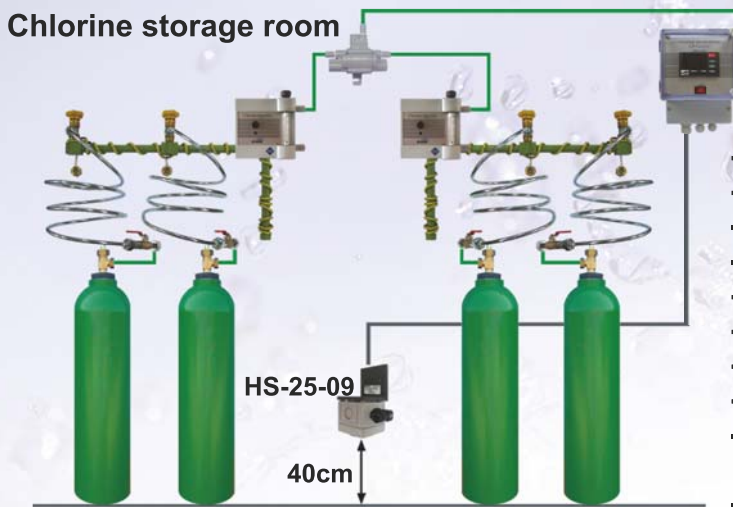
CHLORINE GAS DETECTOR DH 2003



Chlorine gas detector is designed to detect the chlorine presence and to continuously measure chlorine concentration within the zone under supervision (for example, room with chlorine dosing equipment or storage room for full / empty chlorine cylinders). It is capable to detect very low chlorine concentrations, below 0.5 ppm. This device allows the user to set up two completely independent alarm levels, at which will be activated two independent relay contacts, that can turn on external sound / light alarm devices, fans or special devices for the automatic neutralization of chlorine present in the air. Measured concentration is shown on the detectors display in the range of 0 - 10 ppm. The device consists of two parts: measuring sensor - chlorine detector probe HS-25-09 and electronic microprocessor receiver – chlorine detector DH-2003.



CHLORINE GAS DETECTOR DH-2003



CHARACTERISTICS:

- Measuring range: 0-10 ppm
- Measurement resolution: 0.01ppm
- Chlorine detector probe with transmitter
- Response time: 50 sec
- Digital LED display
- Independent adjustment of two limits
- Light indication alarm
- Indication of probe failure
- Continuous measurement of chlorine in the air
- High reliability

TECHNICAL DATA:

CHLORINE DETECTOR ELECTRONICS DH 2003

Power supply:	220 VAC \pm 10%, 50 Hz, single-phase
Power consumption:	4 VA
Input signal:	4 - 20 mA
Output signal:	4 - 20 mA
Output for probe power supply:	12 VDC / 60 mA max.
Stabilization time of measurement:	minimum 180 sec
Alarm Relay Contacts:	2 relays with changeover contacts, 250V/2A, AC/DC
LED display:	3 digits, red color, size 12.5 mm
LED indicators:	Alarm 1: turned on/probe malfunction, Alarm 2: turned on
Ambient temperature:	-15 to 45 ° C
Housing:	ABS plastics, IP65 protection

CHLORINE DETECTOR PROBE HS-25-09

Sensor:	CLH7, sensitive to chlorine (Cl ₂)
Measuring range:	0 - 10 ppm
Maximum concentration:	50 ppm
Operating temperature:	-20 to 50 ° C
Permitted relative humidity:	15% to 90% RV
Response time:	<60 sec for 80% of the current concentration at 20 ° C, relative humidity 50% and 1013 mbar
Expected probes lifetime:	two years in the air (without constant exposure to chlorine)
Connection cable:	2 x 0.75 mm ²
Electrical connection:	4 - 20 mA at 12 V DC (max. 35 V)
Maximum distance:	up to 200 m
Probe orientation:	vertical, directed down
Installation height:	about 0.4 m above the floor
Housing:	PVC, IP65 protection

AUTOMATIC HYPOCHLORITE DOSING CONTROLLER AU2004/6

AUTOMATIC HYPOCHLORITE DOSING CONTROLLER AU-2004 / 6



Based on years of experience in manufacturing and servicing of chlorination equipment, AQUA INTERMA INŽENJERING company has developed a microprocessor device for automatic sodium hypochlorite dosing AU-2004 / 6. All modern principles of computerized control and automation are applied in this device. The basic parts are electronic components made by highly regarded world manufacturers, combined with the management software developed in our company. All principles of water chlorination control are integrated into one universal program, which can be controlled via command panel in Serbian or English language. Controller AU-2004 / 6 designed for automatic, continuous regulation of sodium hypochlorite dosing process in water disinfection, as well as for continuous measurement of residual chlorine in water.



AUTOMATIC HYPOCHLORITE DOSING CONTROLLER AU2004/6

CHARACTERISTICS:

- Microprocessor device that incorporates functions of residual chlorine analyzer and automatic chlorine dosing
- Dosing adjustment according to flow and/or residual chlorine in water, in combination or individually
- Sodium hypochlorite dosing with proportional dosing pumps
- Command via control panel in Serbian or English language.
- Status overview on LCD display 2 x 16 characters
- Connection for chlorine analyzer measuring cell (measuring cell can be ordered optionally)
- Connection for flow meter 4-20 mA
- Connection for pulse water meter (max 5 imp/sec or higher on special request)
- Communication port for connection of one of the following options:
 - Remote control, 6" TFT color graphic display (can be ordered optionally) or
 - Wired or GPRS modem for remote monitoring and changing of process parameters (modem can be ordered optionally) or
 - ETHERNET MODBUS TCP converter or
 - For connection with the computers and formation of (SCADA) systems for control and supervision



* Manufacturer reserves the rights to change and improve software and other parameters of automation.

TECHNICAL DATA:

Power supply:	220V AC, 50Hz
Measurement accuracy:	better than 0.3% at 25 ° C
4 Analog input signals:	4 - 20mA, 47Ω, passive or active power supply 18 - 24VDC
6 Digital inputs:	potential-free contact
6 Digital outputs:	4 x Relay 2A and 2 x Solid State
Communication port:	RS 232/485 MODBUS RTU (optional)
Operating temperature:	0 - 50 ° C
Measuring range of connected sensors:	
Residual chlorine analyzer:	0 - 10 mg / l (parameter)
Flow meter:	1-999 l / s (parameter)



AUTOMATIC CHLORINE DOSING SYSTEM AS-2004/9

AUTOMATIC CHLORINE DOSING SYSTEM AS-2004/9



Based on years of experience in manufacturing and servicing of chlorination equipment, AQUA INTERMA INŽENJERING company has developed the automatic chlorine dosing system AS-2004/9. All modern principles of computerized control and automation are applied in this device.

Integrated differential vacuum regulator compensates oscillations of the vacuum and therefore allows more precise dosing. The basic parts are electronic components made by highly regarded world manufacturers, combined with the management software developed in our company. All principles of water chlorination control are integrated into one universal program, which can be controlled via command panel in Serbian or English language. AS-2004/9 system is designed for automatic, continuous regulation of chlorine dosing process in water disinfection, as well as for continuous measurement of residual chlorine in water, chlorine gas concentration in the air and to control the chlorine neutralization devices.

AUTOMATIC CHLORINE DOSING SYSTEM AS-2004/9



COMPONENTS OF AS-2004/9 SYSTEM

- Controller for automatic chlorine dosing AU-2004/9
- The differential vacuum regulator
- Vacuum meter
- Electromotive dosing valve
- Wall bracket with protective cover



CHARACTERISTICS:

- Microprocessor device that incorporates functions of residual chlorine analyzer, chlorine gas detector and automatic chlorine dosing
- Dosing adjustment according to flow and/or residual chlorine in water, in combination or individually
- Dosing by means of electromotive servo dosing valve for chlorine gas
- Command via control panel in Serbian or English language.
- Status overview on LCD display 2 x 16 characters
- Built-in PLC provides for connection with computers and creation of large supervisory system (SCADA)
- Connection for chlorine analyzer measuring cell (measuring cell can be ordered optionally)
- Connection for flow meter 4-20 mA
- Connection for pulse water meter (max 5 imp/sec or higher on special request)
- Connection for chlorine detector probe HS-25-09, required for activation of neutralization system (detector probe can be ordered optionally)
- Communication port for connection of one of the following options:
 - Remote control, 6" TFT color graphic display (can be ordered optionally) or
 - Wired or GPRS modem for remote monitoring and changing of process parameters (modem can be ordered optionally) or
 - ETHERNET MODBUS TCP converter or
 - For connection with the computers and formation of (SCADA) systems for control and supervision

* Manufacturer reserves the rights to change and improve software and other parameters of automation.

AUTOMATIC CHLORINE DOSING SYSTEM AS-2004/9

CONTROLLER FOR AUTOMATIC CHLORINE DOSING AU-2004/9



Controller for automatic chlorine dosing AU-2004/9 is a microprocessor device designed for automatic, continuous regulation of chlorine dosing process in water disinfection, as well as for continuous measurement of residual chlorine in water, chlorine gas concentration in the air and to control the chlorine neutralization devices. Regulation is performed on the basis of the input parameters of process (water flow and residual chlorine in water), and control of the chlorination process can be according to flow, according to residual chlorine in water, or in combination.

TECHNICAL DATA:

Power supply:	220V AC, 50Hz
Measurement accuracy:	better than 0.3% at 25 ° C
4 analog input signals:	4 - 20mA, 47Ω, passive or active power supply 18 - 24VDC
Analog output:	0 - 10V, 10 bit
6 Digital inputs:	potential-free contact
6 Digital outputs:	4 x Relay 2A and 2 x Solid State
Communication port:	RS 232/485 MODBUS RTU (optional)
Operating temperature:	0 - 50 ° C

Measuring range of connected sensors:

Residual chlorine analyzer:	0 - 10 mg/l (parameter)
Flow meter:	1-999 l/s (parameter)
Chlorine detector:	0-10 ppm (parameter)
Dosing valve for chlorine:	100 gr/h - 10 Kg/h

AUTOMATIC CHLORINE DOSING SYSTEM AS-2004/9

DIFFERENTIAL VACUUM REGULATOR

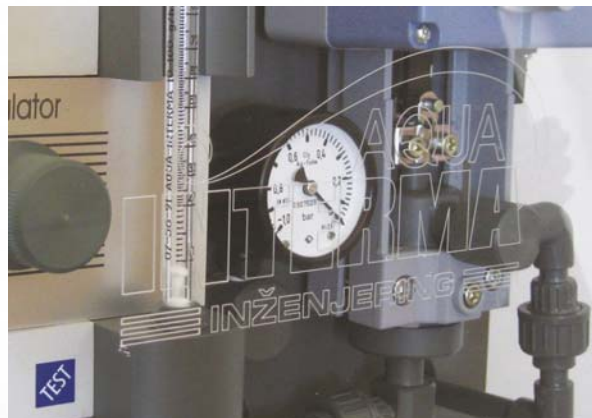


For the correct operation of electromotive dosing valve, a constant pressure drop across the valve is required. Differential vacuum regulator is designed to maintain a constant pressure differential across the valve and to compensate vacuum oscillations which may occur due to changes of operational water flow and changes in the chlorine dosing quantity.

CHARACTERISTICS:

- Made of chlorine resistant materials
- Chlorine resistant membranes and springs
- Gas flow indicator
- Capacity up to 10 kg/h Cl₂

VACUUM METER



CHARACTERISTICS:

- Made of chlorine resistant materials
- Measuring range -1.0 to 0 bar
- Diameter 60 mm

AUTOMATIC CHLORINE DOSING SYSTEM AS-2004/9

ELECTROMOTIVE DOSING VALVE



ELECTROMOTIVE VALVE COMPONENTS:

- Waterproof housing for electric motor placement and protection from moisture and aggressive environment influence
- Special electric motor with associated drive electronics
- Special cable for power supply, command and position feedback signals
- Special dosing valve for chlorine

CHARACTERISTICS:

- Automatic chlorine dosing on the basis of signal from PLC
- High dosing accuracy
- Command 0-10 V or 4-20 mA
- Power supply 24 V AC

WALL BRACKET WITH PROTECTIVE COVER



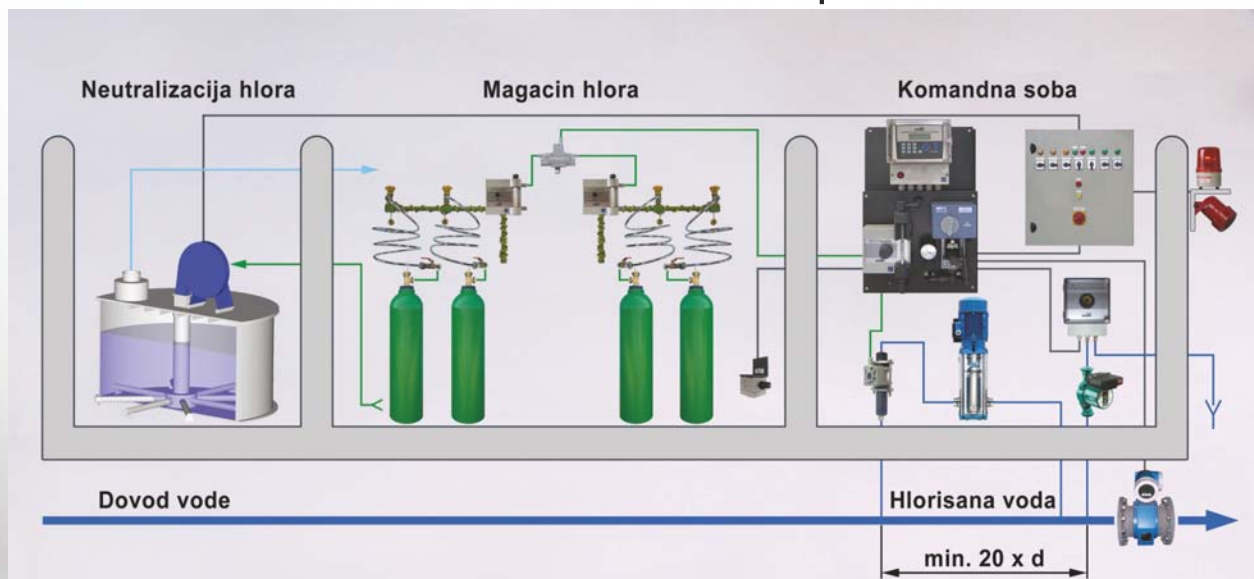
AUTOMATIC CHLORINE DOSING SYSTEM AS-2004/9

Automation of chlorination process significantly reduces the impact of "human error" which is present in case of manual regulation. Well-tuned automatic controller keeps a constant level of residual chlorine in the water always at required level, without human intervention.



Various automatic mechanisms, which were used in last ten years, have been designed as electromechanical or electronic assemblies with the analog operating system. Today, in this field are present modern, digital, microprocessor devices. In addition to unlimited possibilities of programming and adaptation for solving all chlorination problems, these devices are also capable for remote communication with other computers. This increases the possibility of automation and control of all devices on water supply facility from one command center (SCADA).

Automatic control of chlorination process



REMOTE CONTROL PANEL FOR AUTOMATICS



In cases, when the water treatment plant is dislocated from the command center, there is a possibility to transfer all the signals related to the basic parameters of process automation to the master PLC, with TOUCH SCREEN control panel and connection for control and supervision system SCADA. In this way the user is enabled to monitor the complete chlorination system status, with possibility to adjust certain process parameters, if necessary.

CHARACTERISTICS:

- Remote control of all process parameters
- Remote control of chlorination process from the command room
- Digital printer for process parameters (water flow, chlorine residual, valve position, quantity of chlorine that is dosed, etc.)
- Adjustment of automation system parameters



REMOTE CONTROL AND DATA TRANSFER

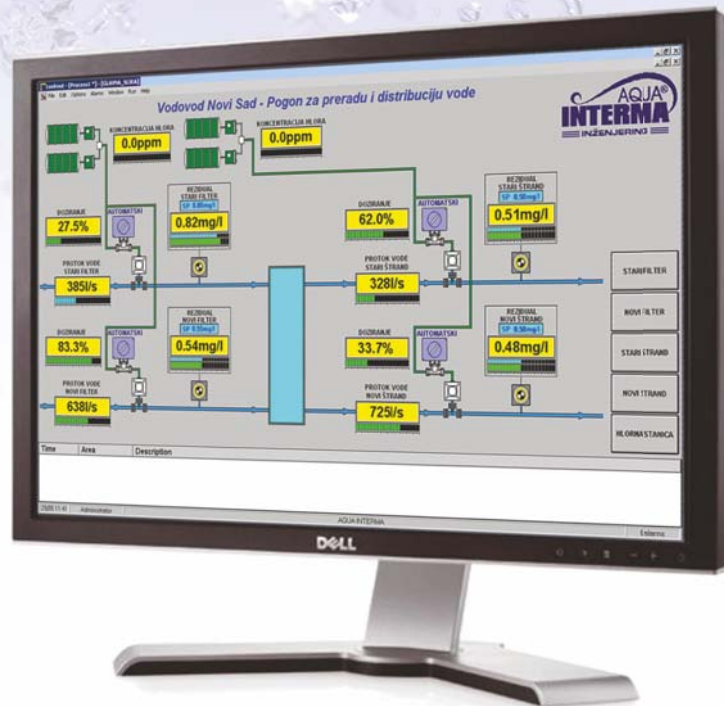


TOUCH SCREEN control panel is made in IP65 protection from the front and has a sound indication of touch. Through dozens of customized screen views, depending on the complexity of the technological process which is followed, a graphical representation of all significant information for the quality process monitoring is provided, as well as detailed procedure of system management.

Application of SCADA software in industrial systems is the best, but very often too expensive solution. In these cases, **TOUCH SCREEN** control panels of new generation are very good compromise. The panels can be delivered two versions, in color and monochrome, upon users request and they can be installed on command cabinet doors or other adequate housings.



SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

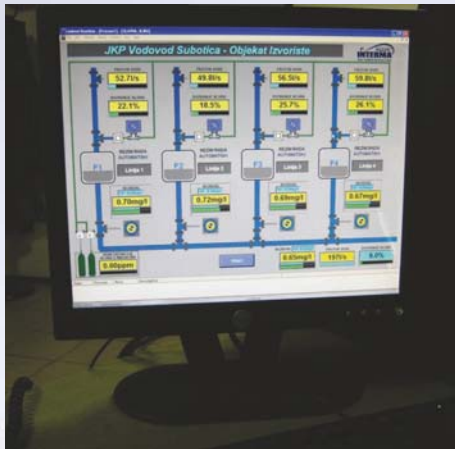


SCADA is a system for supervisory, control, and data acquisition in industrial systems with the display of parameters, where the availability and reliability of this system stands at very high level. Every process in the industry, that makes sense to automate, is a great candidate for the implementation of SCADA systems and networks. These systems include a wide range of equipment, subsystems and technical solutions that enable the data acquisition and processing, as well as appropriate reactions, in different remote systems and processes. Process management, in general, may be automatic or initiated by the operator.

In the field of water treatment systems can be used for simple monitoring of water flow, pressure, chlorine residual, to the very complex monitoring and control of technological processes of water disinfection.



REMOTE CONTROL AND DATA TRANSFER

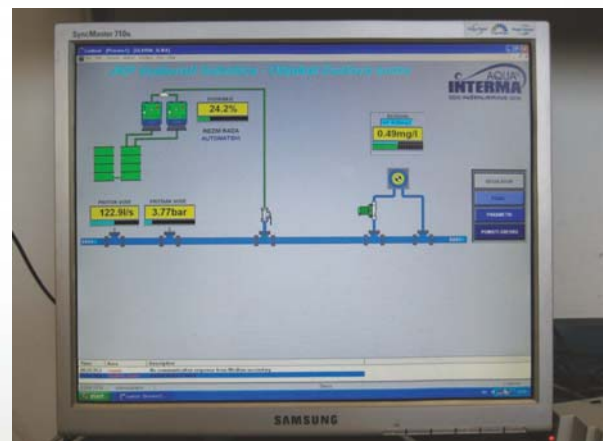
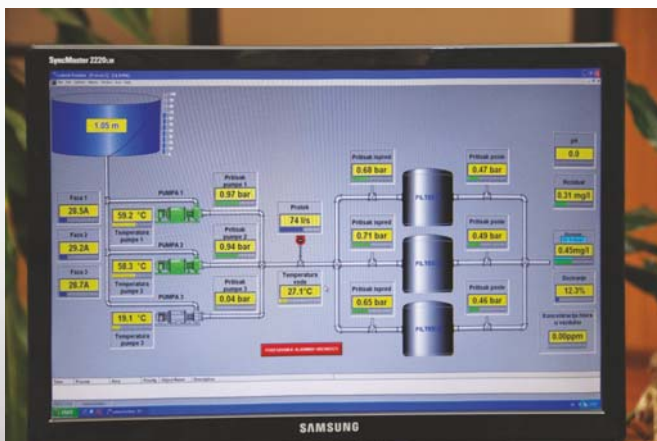


One of the main features of the SCADA system is the centralization of the priority functions on supervisory control unit. Actually, the software support in remote stations ensures data acquisition and local process management to a level that is defined from the central station, but the initiation of all control functions and final verification of their execution is carried out in central station. On this station are defined and transmitted reference signals, formulations are entered, functions of individual subsystems are synchronized and determined reactions to specific alarms, optimization of algorithms is performed, etc. All data are stored in a database from where their presentation is performed as well as generation of control actions. Communication between remote stations and central station, and between individual central stations, is performed through the certain communication medium, depending on the possibilities and demands of user.



For data transfer is used one of the standard or specialized media such as Ethernet, Modbus, Profinet and so on, thus ensuring the transfer of information between remote stations and command center. Optical cables are ideal for implementation of SCADA networks because they can offer complete protection against a variety of radiations and other external influences that could lead to transmission of incorrect information.

SCADA systems are widely used in different business systems and areas, wherever is necessary to monitor and control a large number of processes. Examples of application can be found in electric power systems, water management, industrial complexes, production, traffic and transportation, and so on. The structure and architecture of SCADA system depends on the specific process and requirements of the real business system.



NEUTRALIZATION OF CHLORINE IN THE AIR



In case of an accident, the contaminated air with improper concentration of chlorine gas, is brought into the vessel with distributors, where the dispersion of the gas mixture into the chemical solution, leads to instantaneous neutralization of chlorine from mixture of gases.

In chlorine storage room the chlorine detector probe is placed at about 20 cm from the floor level because the chlorine is concentrating low, on the floor of the room (bulk density of chlorine is 2.5 times greater than air). The detector registers the presence of improper chlorine level in the air and gives a signal for automatic start of neutralization device by turning on high pressure fan. This fan shall immediately evacuate contaminated air from the chlorine storage room to the device in which neutralization is carried out. At the same time, with the device for the neutralization, sound and light alarm signals are switched on, to alert the staff about the accident. Chlorine gas is absorbed in the chemical solution, while purified air is returned to the chlorine storage room (if this storage room has natural ventilation, purified air can be ejected into the atmosphere). Neutralization procedure shall be terminated when the entire amount of chlorine is neutralized. The detector registers that chlorine concentration is in permitted limits, after which it suspends operation of the fan and stops neutralization process.

Simple construction, high efficiency, possibility to adapt to available space, are only some of the advantages of these neutralization systems compared to conventional devices.

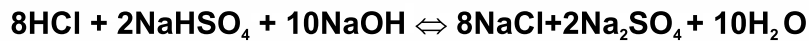
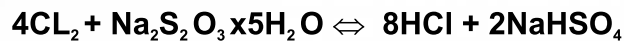
CHLORINE NEUTRALIZATION

OPERATING PRINCIPLE OF NEUTRALIZATION SYSTEM

Neutralization of chlorine is necessary when accident occurs due to the uncontrolled chlorine leakage from cylinder or container (chlorine gas is stored in pressurized vessels) into the chlorine storage room. Neutralization process starts when the concentration of chlorine in the air exceeds the allowed maximum value of 3 mg/l, which leads to a state of imminent and clear danger.

The device neutralizes the chlorine in the air reacting with the sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$) in strongly alkaline environment. The process is irreversible, stoichiometric and has a great and constant speed of reaction. This reaction is practically instantaneous, and the effect is increased with higher dispersion degree of gas in chemical solution thereby achieving the larger specific surface area of contact. Reaction is exothermic ($H^\circ = -2032 \text{ kJ}$), which means that (when the unit is working) chemical solution will warm up more if more chlorine is neutralized.

Chemistry of the process is shown in equations:



or collectively:



From the equation is clear that the reduction agent is sodium thiosulphate $\text{Na}_2\text{S}_2\text{O}_3$, while sodium hydroxide NaOH neutralizes the hydrochloric acid HCl created by the reaction (this oxido-reduction has to be carried out in the very alkali environment). For neutralization process is used the mixture of two chemicals, sodium hydroxide and high concentrated (hydrated) sodium thiosulphate. From the reaction stoichiometry can be seen that for neutralization of 1 kg of chlorine is necessary to spend a 0.875 kg of sodium thiosulphate and 1.410 kg of sodium hydroxide. Since the efficiency of neutralization reaction is approximately 80%, it is necessary to prepare 20% more chemical solution than is theoretically needed to neutralize a certain amount of chlorine.



CHLORINE NEUTRALIZATION

After the process, neutralization tank must be flushed with clean water to avoid salt crystallization on the device surfaces and openings for gas distribution. For this purpose, worn out chemical solution is removed from the tank, which is then washed good with brush and hose and filled with clean water. After the filling of tank to the top, a high pressure fan is turned on and left in operation for some time to enable the washing of eventually precipitated crystals inside of pipe distributors.

The removal of chemical solution is carried out into the sewer, by controlled dilution with 130 times larger quantity of water. By doing so, the concentration of NaCl and Na₂SO₄ is being reduced to the legally permissible values (500 mg/l for chlorides and 350 mg/l for sulphates). Based on stoichiometry, can be calculated that for every 1 kg of neutralized chlorine is formed 1 kg of chlorides (as Cl) and 0.676 kg of sulphates (as SO₄²⁻). In particular case, from one 1000 kg container, there will be 1000 kg of chlorine and 676 kg of sulphates, and for reduction of chlorides and sulfates concentration is required a huge amount of dilution water before their discharge into the sewer (for neutralization tank of 8.0 m³ is needed approximately 1040 m³ of water for dilution). Thinning can be performed by taking of a small volume of worn out solution which is poured into a suitable tank, where it is 130 times diluted with water, or it is a continuous process, where the dilution is done directly into the drain, with proper adjustment of solution and water flow. Another way of treating the waste solution is to pump it from the neutralization tank to the tank vehicle, transport it to appropriate landfill and discharge it there.



Note: It is necessary to control the concentration of chemical solution every 6 months, and depending on the determined solution quality, to add a certain amount of chemicals. Complete replacement of chemical solution is required every 2 years.

CHLORINE NEUTRALIZATION

Neutralization system includes following components:

- High pressure fan for evacuation of chlorine from the contaminated area
- Neutralization tank with pipe distributors
- Chlorine gas detector in the chlorine storage room
- Electric cabinet
- Sound and light alarm signalization
- Suction/discharge installations

Neutralization tank and all its elements are made of hard high-density polyethylene, making it completely resistant to aggressive chemicals, present in the neutralization process. Therefore no additional protection, in the form of painting or coating, is required. Device dimensions are such that it can be placed in any normal size room, without any specific foundation (a floor or other flat surface is sufficient for installation).

Depending on the amount of chlorine that needs to be neutralized following types of neutralization systems are available:

Type	Capacity
N-50.01	for up to 50 Kg of chlorine
N-100.01	for up to 100 Kg of chlorine
N-200.01	for up to 200 Kg of chlorine
N-400.01	for up to 400 Kg of chlorine
N-800.01	for up to 800-1000 Kg of chlorine

HIGH PRESSURE FAN

A fan, that provides 5-20 changes per hour of the entire volume of air from chlorine storage room, is required for effective neutralization. With a proper fan type it is possible to reduce the concentration of chlorine in the chlorine storage (where the accident occurred) for about 30 minutes. The process ends when chlorine concentration drops below the permitted limits (when the total amount of chlorine is completely absorbed in the device).

The concentration of chlorine in the room where there has been accidental chlorine effusion can be calculated by the equation:

$$\ln C_t = \ln C_o - qt/V$$

where members from the equation are:

q (m³/h) fan capacity

V (m³) volume of the room

t (h) time of ventilation

C_o (gr/m³) initial concentration of chlorine

C_t(gr/m³) chlorine concentration after time t

CHLORINE NEUTRALIZATION



The fan, used for this purpose, must meet another important requirement, to overcome the high pressure drop in the device. This pressure drop is a result of height of a liquid column above the pipe distributor, through which the gas mixture is injected into the chemical solution. This requires the use of radial, high pressure fan, whose parts that are coming into the contact with a mixture of chlorine gas and air, must be resistant to the aggressive effects of chlorine.

To maintain the homogeneity of the solution and prevent any crystallization of dissolved chemicals, it is necessary to periodically turn the device on manually, in order to mix the chemical solution (once a week, twenty minutes).

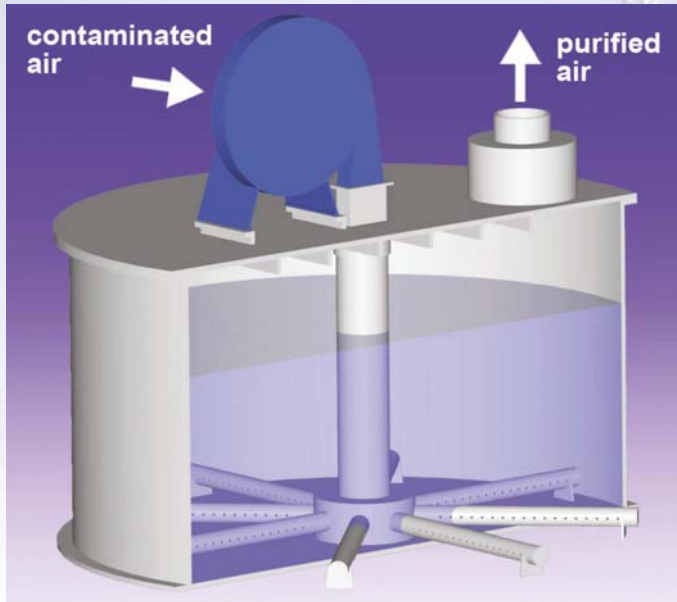
NEUTRALIZATION TANK WITH PIPE DISTRIBUTORS

This vessel is a part of the neutralization device, used as a tank for chemical solution, where the contact of air / chlorine gas mixture and chemical solution is performed. Created compounds, sodium sulphate and sodium chloride, will remain in solution and purified air can be sent back to the chlorine storage room or released into the atmosphere. The mechanism that ensures the contact of two phases is the dispersion of gas mixture air / chlorine in chemical solution. It is done by injecting the gas phase through specially designed pipe distributors, that ensure the uniform distribution of the gas phase over the entire surface of the device and a high degree of gas dispersion.

The air is injected into the solution with high velocity through the pipe distributor creating the so-called jet mode. This ensures the formation of small diameter bubbles, which provides a substantial contact surface for successful absorption of chlorine from the gas mixture. At the same time, intensive solution mixing is carried out, so the additional equipment for mixing and homogenization of the solution is not needed.

Volume of neutralization tank should be sufficient to contain the amount of solution needed to neutralize chlorine from one chlorine cylinder or container.

CHLORINE NEUTRALIZATION



Neutralization tank and high pressure fan

The pressure loss in the device largely depends on the amount of solution in the neutralization tank, which is designed for height of a liquid column of 40 cm (above the pipe distributor). It is very important to adhere to this instruction during the maintenance operation (exchange of chemicals), i.e. do not exceed the upper solution height limit, in order to maintain the appropriate parameters in the device and keep the quality of the contaminated air evacuation from the room where the accident occurred.

All other parts of the device have been designed to provide a minimal resistance to flow of gas mixtures. The fan is mounted on the top of device and its function is to insufflate the gas mixture into the chamber, from which the mixture is injected to the pipe distributor. Above the solution surface is free space that provides a smooth release of gas from the two-phase system (gas/liquid) and its flow toward the opening for the evacuation of gas from the apparatus. In the opening for the evacuation of gas is installed a separator of drops which has the task to extract individual droplets of solution that are caught up in gas flow.



CHLORINE NEUTRALIZATION

CHLORINE GAS DETECTOR DH-2003

Chlorine gas detector is always placed in the chlorine storage room. The device is designed to detect the chlorine presence in the air as soon as chlorine concentration reaches the sensitivity threshold of the instrument. Already at that concentration a sound alarm is switched on, which indicates to a control center that the accident occurred. The device has a measuring probe and 2 max/min alarm limits, which are set within the measuring range. The sensor is located inside of measuring cell, which is filled up with a special solution (measuring cell functions as an electrolytic element). The detector registers and measure (with the digital display of values) chlorine gas in the air inside of chlorine storage room and provides a signal to automatically turn on the neutralization device, if the concentration of chlorine gas in the air exceeds the maximum allowed value. Sound alarm warning is actuated as soon as chlorine appearance is detected in the chlorine storage room. If the concentration of chlorine exceeds the set point, the neutralization system will start automatically.



Note: device must be controlled and calibrated by the manufacturer every 6 months.



Sound and light alarm signals



Electric cabinet

CHLORINE NEUTRALIZATION



Note: Experience has shown that during the replacement of chlorine container or cylinder, some small amount of chlorine can be detected in the air (which usually exceeds the threshold sensitivity of the chlorine detector) and possible sound warning signal should not be considered alarming if it stops shortly after the fan is switched on.



SPARE PARTS AND ACCESSORIES

In addition to the activities in the domain of production, we also have all spare parts, elements, accessories and fittings for connection of chlorination devices in vacuum installation. All these products are made of chlorine resistant materials.



- T-pieces
- Fittings
- Non-return valves
- Extensions
- Reductions
- Springs
- Gaskets



SPARE PARTS AND ACCESSORIES



- Chlorine valves
- Flexible tubes
- Ball valves
- Diffusers
- Vacuum hose
- Heaters



GAS CHLORINATION SYSTEMS



There are numerous combinations of gas chlorination systems whose selection, first of all, depends on the amount of chlorine that is dosed, methods of process regulation, technological process of water treatment, automation level of water treatment plant and other.

Here we will present the basic combinations of chlorination devices, but to select the appropriate system it is recommended to consult with the manufacturers of the equipment. All presented chlorination systems can be combined with each other and upgraded.

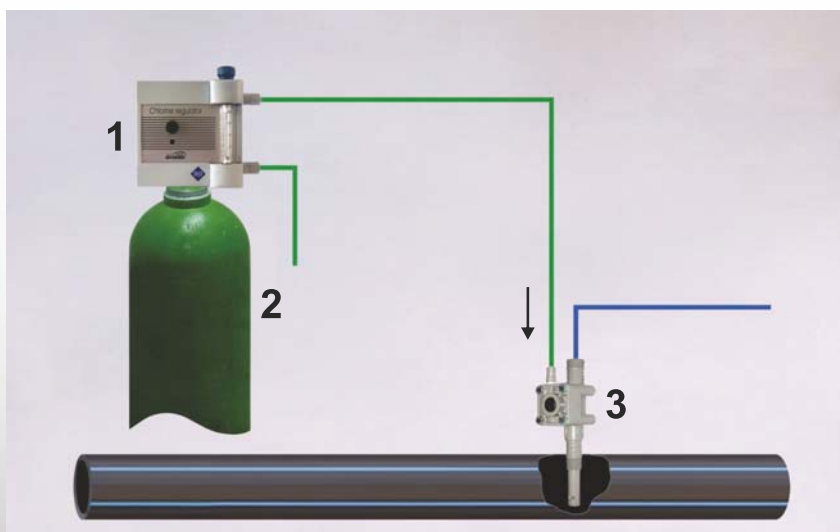


FUNCTIONAL DESCRIPTION

Chlorination system is designed to ensure that the installation operates under vacuum, and that the only small part of the installation works under pressure. All installations which are under pressure (from chlorine cylinder to the vacuum regulator, usually up to 6 bar), must be placed in a separate room (chlorine storage room). The other part of installations for distribution of chlorine, from vacuum regulator to the injector (the dosing spot) is under vacuum, and can be up to 900 m long, without fear that there will be a chlorine leakage. The presence of vacuum in the installation, prevents the release of chlorine and unwanted consequences due to damaged installation or equipment, bad sealing or other. The vacuum in installation is provided by the injector, when feed water, needed for injector's operation, passes through the Venturi tube. Underpressure, created on the exit of the Venturi tube, allows the opening of the injector's check valve, thereby creating a vacuum in the installation, which opens the inlet valve on the vacuum regulator. By opening of inlet valve begins the process of chlorine dosing. Due to the loss of vacuum, caused by the exclusion of feed water, damaged installation, and so on (vacuum falls, and weakens in intensity) the inlet valve of vacuum regulator closes and stops the process of chlorination. Depending on the required amount of chlorine dose and back pressure (the pressure in the pipeline where the injection is performed), selection of appropriate booster pump (for feed water) is done, according to precisely defined characteristics. Injector is equipped with built-in non-return valve which prevents feed water penetration into the vacuum installation.

TYPES OF SYSTEMS

The simplest gas chlorination system consists of a vacuum regulator and injector, and it is used for smaller facilities where chlorine consumption is constant.



1. VACUUM REGULATOR
2. CHLORINE CYLINDER
3. INJECTOR

HS-2.1 (up to 0-2 kg / h)
- vacuum regulator up to 2 kg/h
- injector I-4

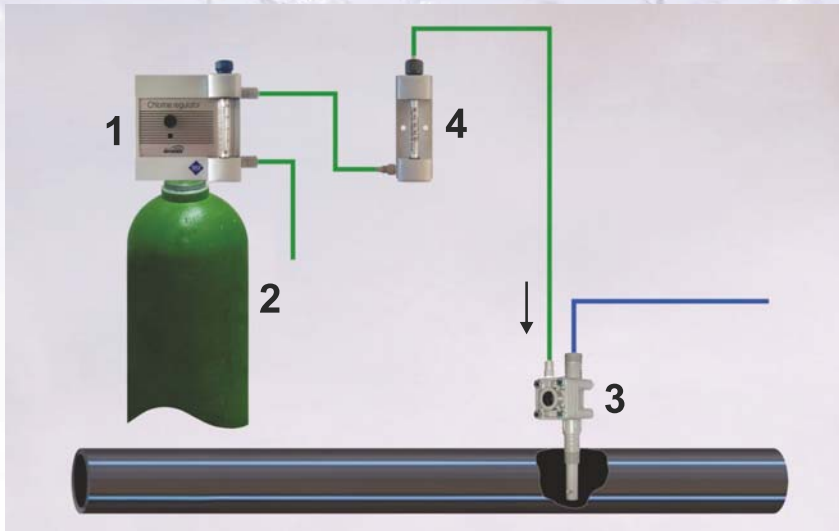
HS-4.1 (up to 4 kg / h)
- vacuum regulator up to 4 kg/h
- injector I-4

HS-10.1 (up to 10 kg / h)
- vacuum regulator up to 10 kg/h
- injector I-10

GAS CHLORINATION SYSTEMS

MANUAL CONTROL

In facilities where the frequent regulation of chlorine dose is required, could be used a system consisting of vacuum regulator without dosing valve, rotameter (which is located outside the chlorine storage room) and injector.



1. VACUUM REGULATOR
2. CHLORINE CYLINDER
3. INJECTOR
4. ROTAMETER

HS-2.2 (up to 0-2 kg/h)

- vacuum regulator up to 2 kg/h
- injector I-4
- rotameter up to 2 kg/h

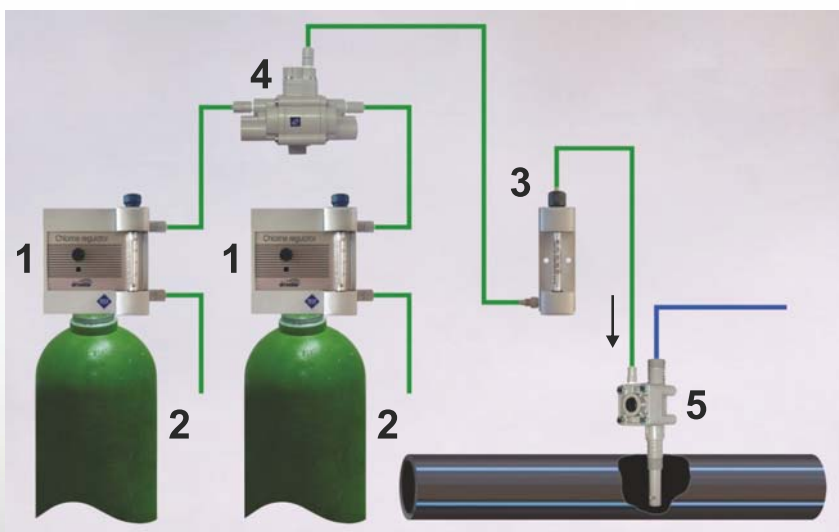
HS-4.2 (up to 4 kg/h)

- vacuum regulator up to 4 kg/h
- injector I-4
- rotameter up to 4 kg/h

HS-10.2 (up to 10 kg/h)

- vacuum regulator up to 10 kg/h
- injector I-10
- rotameter up to 10 kg/h

Automatic vacuum switch works in semi-automatic and automatic systems with two chlorine cylinders and it is designed to secure uninterrupted operation and chlorine supply. Its design allows to switch over the chlorine supply from the second cylinder at the time of complete discharge of the first one. By doing so, not only a continuous feed, but a smooth exchange of empty tanks is secured.



1. VACUUM REGULATOR
2. CHLORINE CYLINDER
3. ROTAMETER
4. VACUUM SWITCH
5. INJECTOR

HS-2.3 (up to 0-2 kg/h)

- vacuum regulator up to 2 kg/h
- injector I-4
- rotameter up to 2 kg/h
- vacuum switch

HS-4.3 (up to 0-4 kg/h)

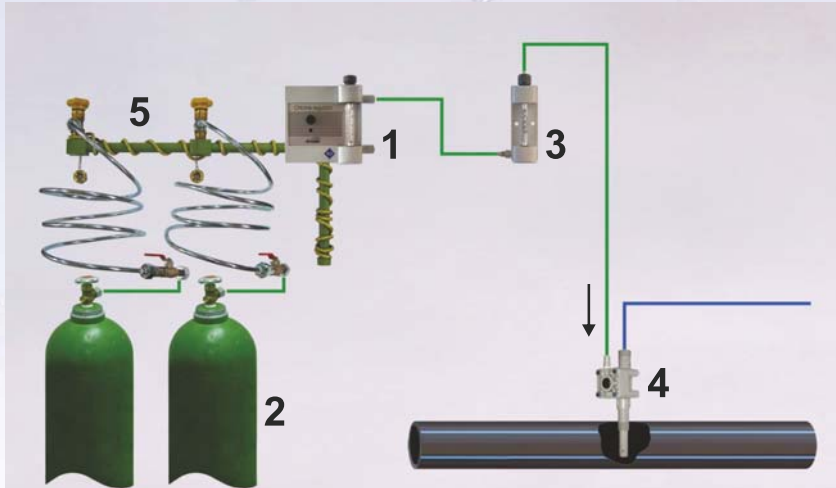
- vacuum regulator up to 4 kg/h
- injector I-4
- rotameter up to 4 kg/h
- vacuum switch

HS-10.3 (up to 10 kg/h)

- vacuum regulator up to 10 kg/h
- injector I-10
- rotameter up to 10 kg/h
- vacuum switch

GAS CHLORINATION SYSTEMS MANUAL CONTROL

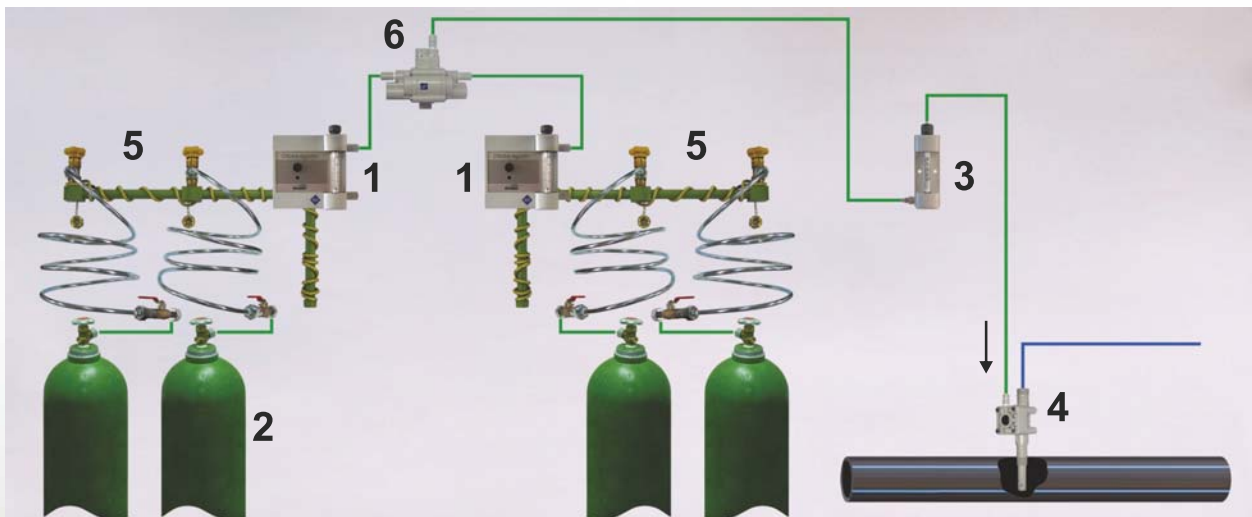
If the operating conditions require higher consumption of chlorine, it is possible to connect 2, 3, 4 or more chlorine cylinders to appropriate receivers - manifolds.



- 1. VACUUM REGULATOR
- 2. CHLORINE CYLINDER
- 3. ROTAMETER
- 4. INJECTOR
- 5. MANIFOLD FOR TWO CHLORINE CYLINDERS

More complex system than the previous one includes two manifolds, two vacuum regulators, vacuum switch, rotameter and injector.

When chlorine cylinders, connected to the first manifold, are empty, automatic vacuum switch enables the chlorine supply from the second manifold and allows a smooth exchange of empty chlorine cylinders, without the interruption of the chlorination process.



- 1. VACUUM REGULATOR
- 2. CHLORINE CYLINDER

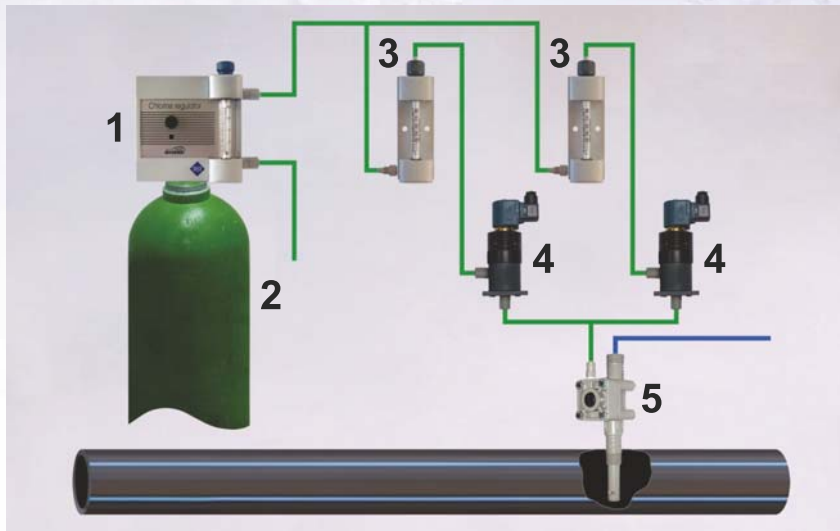
- 3. ROTAMETER
- 4. INJECTOR

- 5. MANIFOLD FOR TWO CHLORINE CYLINDERS
- 6. VACUUM SWITCH

GAS CHLORINATION SYSTEMS

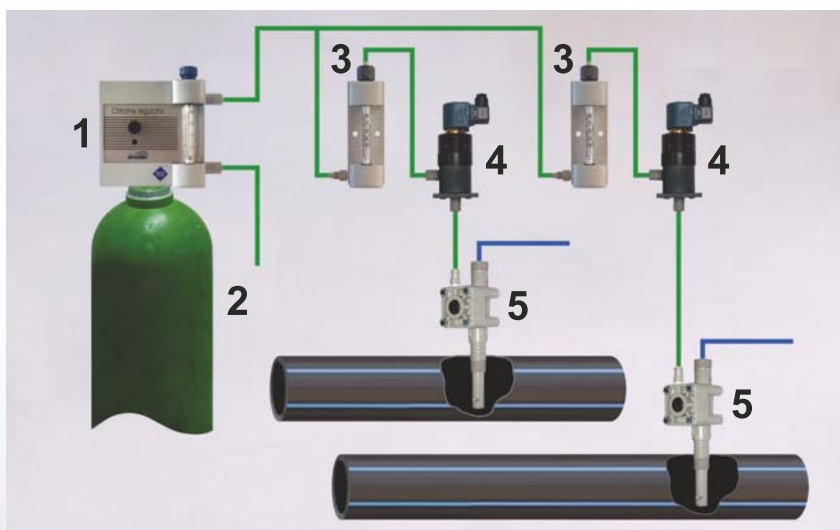
SEMI-AUTOMATIC CONTROL

In installations, where the change of chlorine consumption is huge, and conditioned by the flow change in common pipeline (for example, if the well pumps are constantly being switched on and off), the system with solenoid valves for chlorine is used. The operation of these valves is directly related to the operation of well pumps. The system consists of a vacuum regulator, injector and as many rotameters and solenoid valves for chlorine, as there are well pumps.



1. VACUUM REGULATOR
2. CHLORINE CYLINDER
3. ROTAMETER
4. SOLENOID VALVE FOR CHLORINE
5. INJECTOR

The same principle can be applied in case when each pump distributes water into independent pipeline.



1. VACUUM REGULATOR
2. CHLORINE CYLINDER
3. ROTAMETER
4. SOLENOID VALVE FOR CHLORINE
5. INJECTOR

In installations where the water flow is constant and uninterrupted, previous system can be simplified. In this case the solenoid valves for chlorine are not necessary. Instead of them we are using as much rotameters and injectors as there are pipelines.

GAS CHLORINATION SYSTEMS

AUTOMATIC CONTROL

The most complex chlorination system is automatic chlorination system, with continuous measurement of water flow, concentration of residual chlorine in water and control of system for neutralization of chlorine in the air.

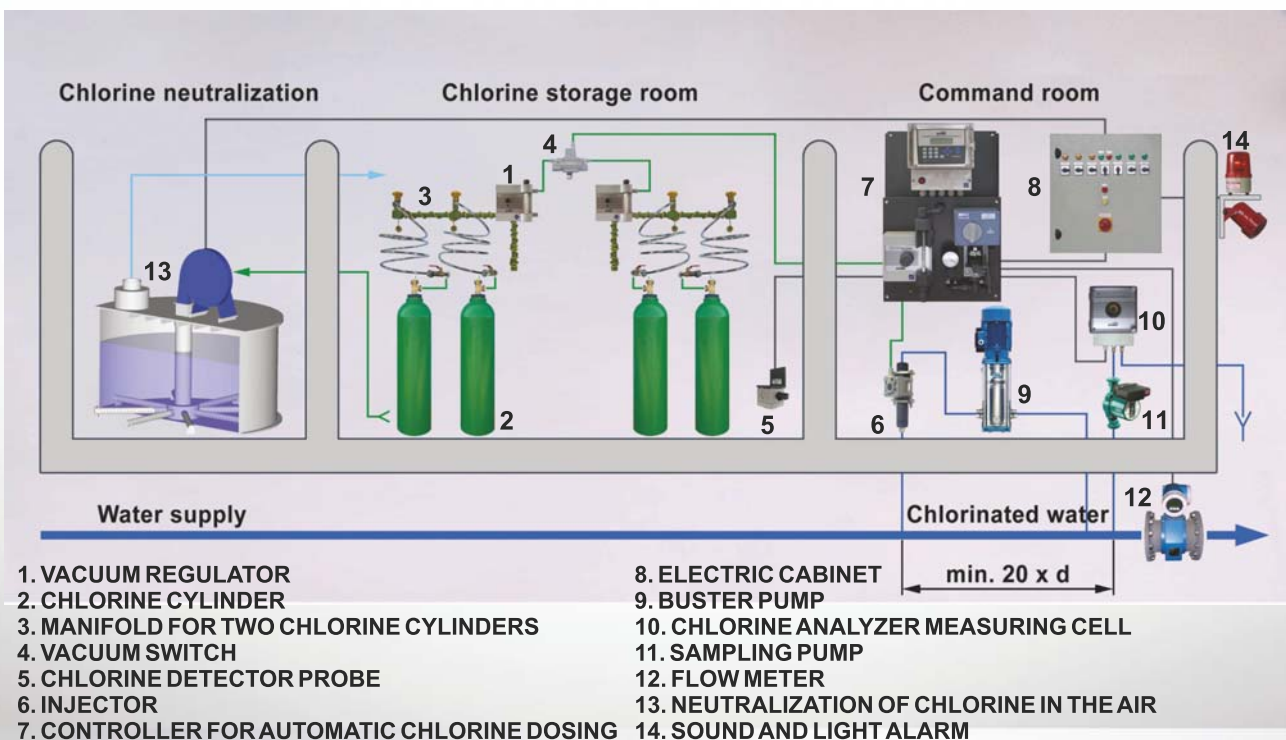
Automation of chlorination process significantly reduces the impact of "human error" which is present in case of manual regulation. Well-tuned automatic controller keeps a constant level of residual chlorine in the water always at required level, without human intervention. Controller, based on continuous measurement of residual chlorine in the water (with chlorine residual analyzer) increases or decreases the chlorine dose. This mode is called "control according to residual."

There is a different kind of control that is used when the water flow is variable. For smaller amounts of water less chlorine is needed, and for bigger water quantities, proportionally more chlorine is necessary. Controller receives the information about current flow from the appropriate flow meter, and on the basis of that information, increases or decreases the amount of chlorine dose. This kind of control is called "control according to flow."

The most complex way of process control is used if water has a variable chemical properties over time (and thus the need for chlorine) and at the same time, variable flow. In this case we have "control according to flow and residual", or combined control.

Regardless of the chlorination process, the controller also performs a supervisory function over the concentration of chlorine in the air. This is the part of management program related to "device for neutralization of chlorine in the air" which may appear as an option. This device should eliminate (neutralize) chlorine present in the air (as a very dangerous substance) if a chlorine leak occurs, as a result of an accident or breakdown.

The automatic chlorine dosing system



CHEMICAL DOSING EQUIPMENT



ETATRON D.S.

In the field of chemical dosing we have established cooperation with the Italian company ETATRON DS, which produces a wide range of metering pumps for dosing of sodium hypochlorite and other chemicals, as well as other devices for measuring and regulation that are used in water treatment.

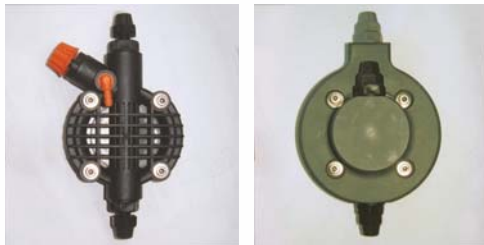
- Solenoid dosing pumps
- Motor driven (piston and diaphragm) dosing pumps
- Peristaltic dosing pumps
- Chemical pumps for aggressive fluids





- Controllers
- Devices for control and regulation
- Measuring devices and instruments
- Flow meters
- Dosing tanks
- Manual and electric mixers
- Probes, brackets, cables, fittings
- Spare parts and accessories

 **ETATRON D.S.**



SODIUM HYPOCHLORITE DOSING SYSTEMS



There are numerous combinations of sodium hypochlorite dosing systems, whose selection, first of all, depends on the amount of chlorine that is dosed, methods of process regulation, technological process of water treatment, automation level of water treatment plant and other.

Here we will present the basic combinations of sodium hypochlorite dosing systems, but to select the appropriate system it is recommended to consult with the manufacturers of the equipment. All presented dosing systems can be combined with



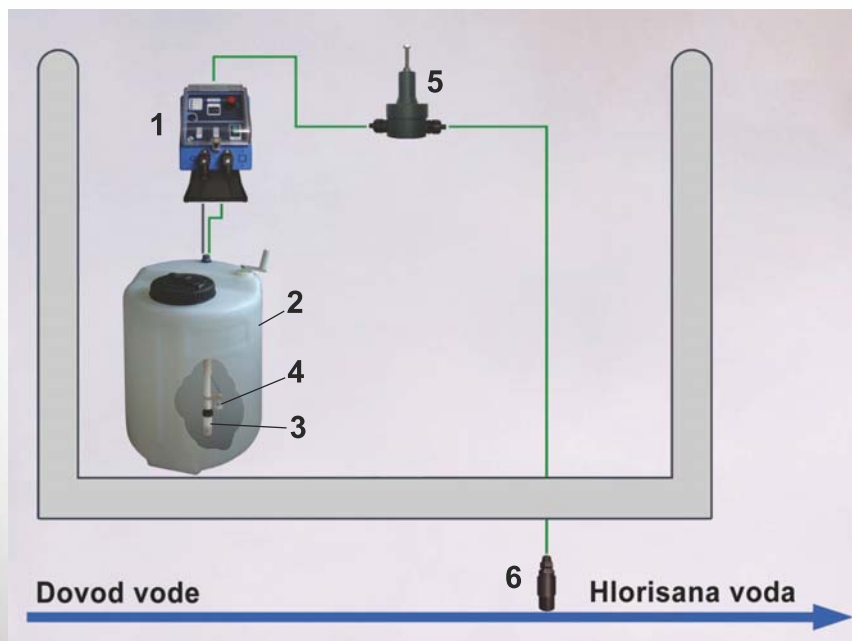
SODIUM HYPOCHLORITE DOSING SYSTEMS

FUNCTIONAL DESCRIPTION

Sodium hypochlorite dosing systems are usually used as a systems for post-chlorination or in cases where the quantity of water, which must be treated, is not large (water disinfection in hotels, schools, swimming pools, small water systems, food and beverage industry, etc.). This form of chlorination is commonly used for capacities up to 10 l / s of clean water, but if necessary, these systems may be used for much larger capacities. The medium that is added as a disinfectant is solution of sodium hypochlorite. Dosing of sodium hypochlorite can be performed directly into the pipeline, using appropriate dosing pumps and injection valves, or in the water tank. Dosing pumps can be controlled in several ways, and depending on the user's request and possibility for installation of the additional equipment, pump control can be manual, semiautomatic and automatic. Automation of chlorination process significantly reduces the impact of "human error" which is present in case of manual regulation. Well-tuned automatic controller keeps a constant level of residual chlorine in the water always at required level, without human intervention.

TYPES OF SYSTEMS

The simplest dosing system consists of chlorine dosing pump, sodium hypochlorite tank, foot valve, level probe, back pressure valve and injection valve. This system is applied in cases when the water flow is constant. Besides the manual control, this system can perform semi-automatic control by providing some external signal for dosing pump (on/off signal from well pump, buster pump, etc.).

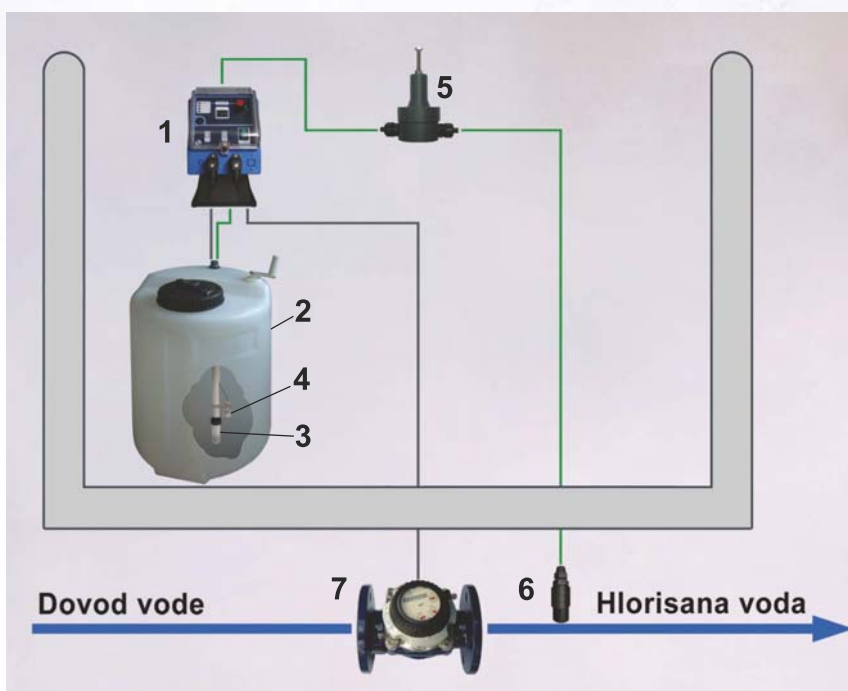


1. Dosing pump
2. Hypochlorite tank
3. Foot valve
4. Level probe
5. Back pressure valve
6. Injection valve

SODIUM HYPOCHLORITE DOSING SYSTEMS

More complex system consists of dosing pump, sodium hypochlorite tank, foot valve, level probe, back pressure valve, injection valve and pulse water meter. This system is used when the water flow is variable. For smaller amounts of water less chlorine is needed, and for bigger water quantities, proportionally more chlorine is necessary.

Dosing pump receives the information about current flow from the appropriate flow meter (pulse water meter), and on the basis of number of received pulses, increases or decreases the amount of chlorine dose. This kind of control is called "control according to flow."



1. Dosing pump
2. Hypochlorite tank
3. Foot valve
4. Level probe
5. Back pressure valve
6. Injection valve
7. Pulse water meter

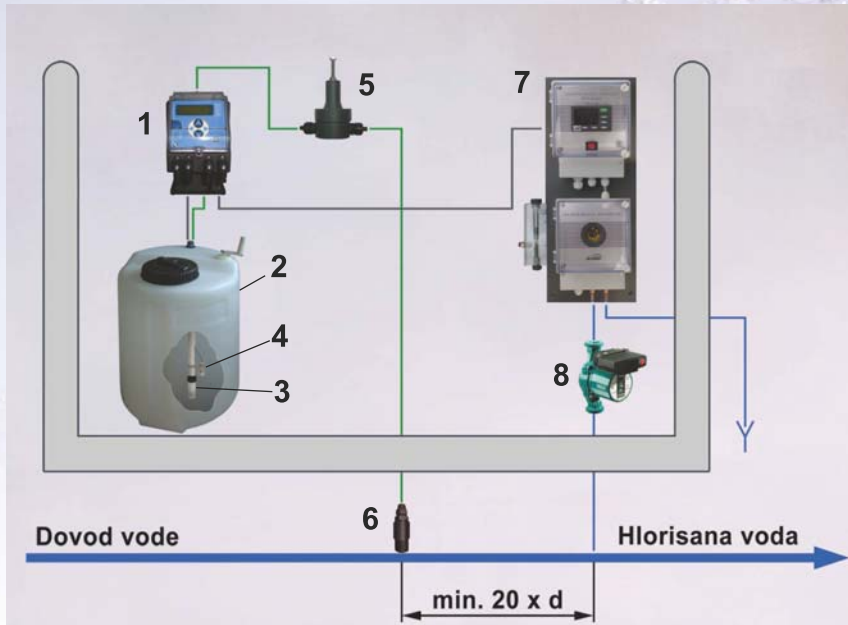
More complex dosing system, similar to the previous one, consists of a dosing pump, sodium hypochlorite tank, foot valve, level probe, back pressure valve, injection valve and chlorine residual analyzer. This system is used when the water has a variable chemical properties over time.

Dosing pump, based on continuous measurement of residual chlorine in the water (with chlorine residual analyzer) increases or decreases the chlorine dose, proportional to received signal from the analyzer. This type of control is called "control according to residual"

Note:

In some cases, for taking of water samples can be used a certain sampling pump (for example, when the water after sampling must be returned in the pipe)

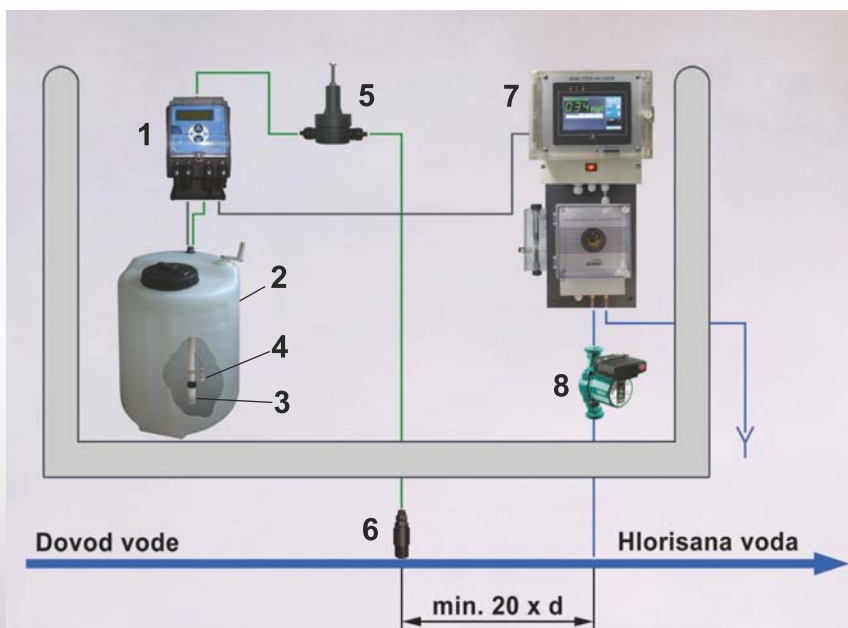
SODIUM HYPOCHLORITE DOSING SYSTEMS



1. Dosing pump
2. Hypochlorite tank
3. Foot valve
4. Level probe
5. Back pressure valve
6. Injection valve
7. Chlorine residual analyzer
8. Sampling pump

During the water disinfection, it is often necessary to make a record of residual chlorine value in function of time. When we have a continuous measurement of chlorine residual it is possible to show this measurement on the appropriate analog or digital devices - printers.

Some residual chlorine analyzers have integrated digital printer, which allows the user to look at the chlorine residual value at any time.

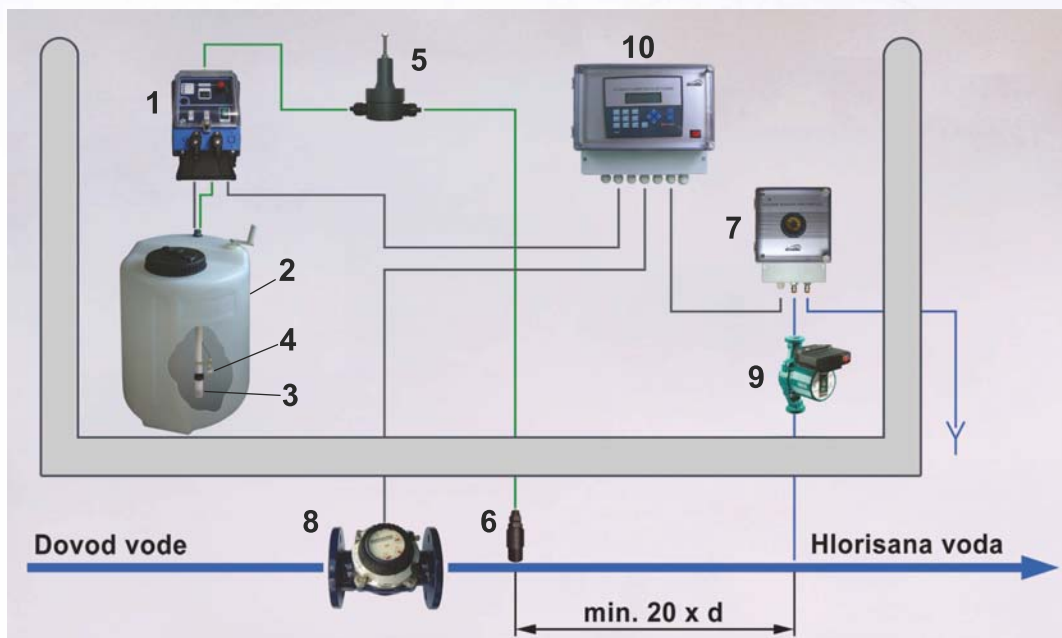


1. Dosing pump
2. Hypochlorite tank
3. Foot valve
4. Level probe
5. Back pressure valve
6. Injection valve
7. Chlorine residual analyzer with digital printer
8. Sampling pump

SODIUM HYPOCHLORITE DOSING SYSTEMS

The most complex way of process control is used if water has a variable chemical properties over time (and thus the need for chlorine) and at the same time, variable flow. In this case we have a chlorination system that consists of dosing pump, sodium hypochlorite tank, foot valve, level probe, back pressure valve, injection valve, chlorine residual analyzer, pulse water meter and controller for automatic dosing of hypochlorite.

In this case, based on continuous measurement of residual chlorine in water and current water flow measurement, the controller operates the dosing pump, which increases or decreases the amount of chlorine dose, proportional to the signal received from the controller. In this case we have "control according to flow and residual", or combined control.



- | | |
|------------------------|--|
| 1. Dosing pump | 6. Injection valve |
| 2. Hypochlorite tank | 7. Chlorine analyzer measuring cell |
| 3. Foot valve | 8. Pulse water meter |
| 4. Level probe | 9. Sampling pump |
| 5. Back pressure valve | 10. Controller for automatic hypochlorite dosing |

All presented sodium hypochlorite dosing systems can be combined with each other and upgraded.

The same equipment and devices, with certain restrictions, can be used for dosing of other chemicals used in water treatment or other technological processes.

SODIUM HYPOCHLORITE DOSING SYSTEMS

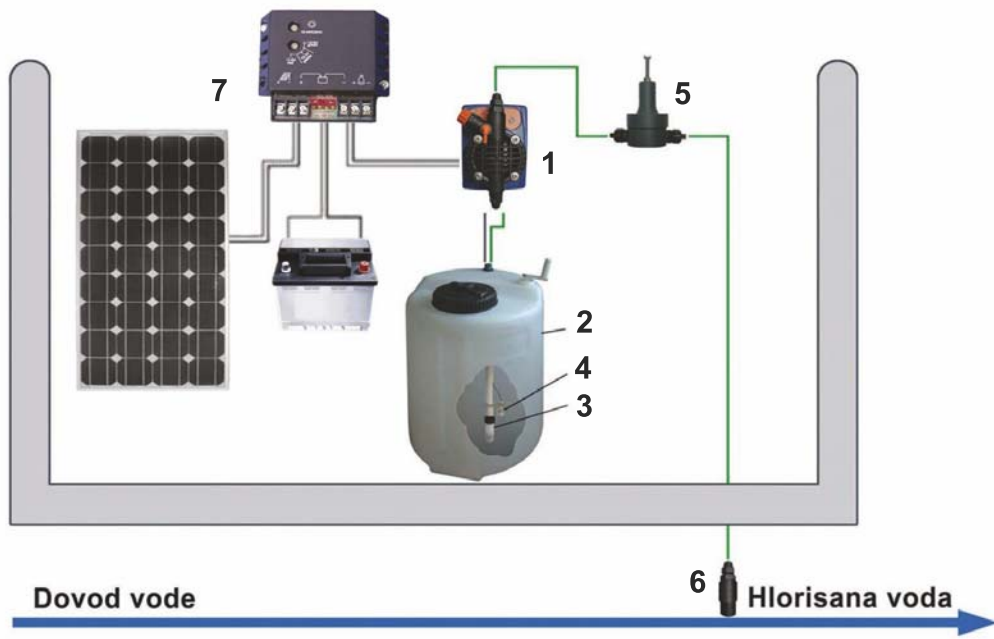
Sometimes the locations, where the installation of the equipment for water disinfection is planned, are in inaccessible places, with poorly developed infrastructure, and without possibility for permanent electric power supply. In these cases, there are many systems that can represent alternative solutions.

SYSTEM WITH SOLAR POWER SUPPLY



When there is no possibility for permanent electric power supply, renewable energy sources are always available. One of these forms of energy, which has great potential, is solar energy

Solar panels are increasingly used in many modern installations and systems.



1. Dosing pump
2. Hypochlorite tank
3. Foot valve
4. Level probe
5. Back pressure valve

6. Injection valve
7. The solar system:
 - Solar panel
 - Controller
 - Battery

SODIUM HYPOCHLORITE DOSING SYSTEMS

CHEMICAL INJECTION PUMP "CHEMILIZER"

Chemical injection pump has a unique engine driven by water, with a membrane which allows precise dosing in proportion to the flow of water. There is only one moving part which allows easy maintenance.



Chemilizer works at pressure range from 0.14 bar up to 6 bar and flow rate from 0.75 l/min to 157 l / min. For the operation of this device electric power supply is not required.



DISINFECTION WITH SILVER IONS

ECO AQUA CLEANER

- Device for microbiological disinfection of water, based on the silver ions
- It is used for disinfection of wells, small swimming pools and reservoirs
- Ability to work on 220V power supply or battery (12V, 55A)

The device consists of a system of electrodes of different compounds on the basis of silver with strong and proven antibacterial properties. It works on the potential difference of electrodes. Different electrode materials under the influence of electric current releases a certain types of cations and anions (finely dispersed ions), that have specific antibacterial properties (the ability to destroy bacteria).

Electrodes are polarized with direct current which creates the silver ions. Released into the water these ions act as powerful and natural disinfecting agents. Even in small concentration, silver effectively destroys microorganisms. Some organisms die in presence of silver in ratio: 1 fraction of silver to 100 million fractions of water. This great antibacterial effectiveness of silver is explained with the high sensitivity of the microorganism cell plasma to silver ions. (It is proven that the lower level of antibacterial action of silver is 2×10^{-11} g ions/dm³). It has been shown that these ions (silver ions) are entering inside of the microorganism cell, bind to the protoplasm and destroys it. It is also proven that silver ions adsorbs themselves on the microorganism cell, and plays a catalytic role in the process of plasma oxidation by oxygen from air. The effect of antibacterial action is achieved on prolonged contact, after which the water disinfection is done. This product was developed in cooperation with Faculty of Technology and patented. Eco Aqua Cleaner has won the first prize of Belgrade and Serbian Chamber of Commerce, as an environmentally product.





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