

Recommendations for the Chemical Disinfection of Drinking Water Installations in Buildings



Drinking Water Disinfection

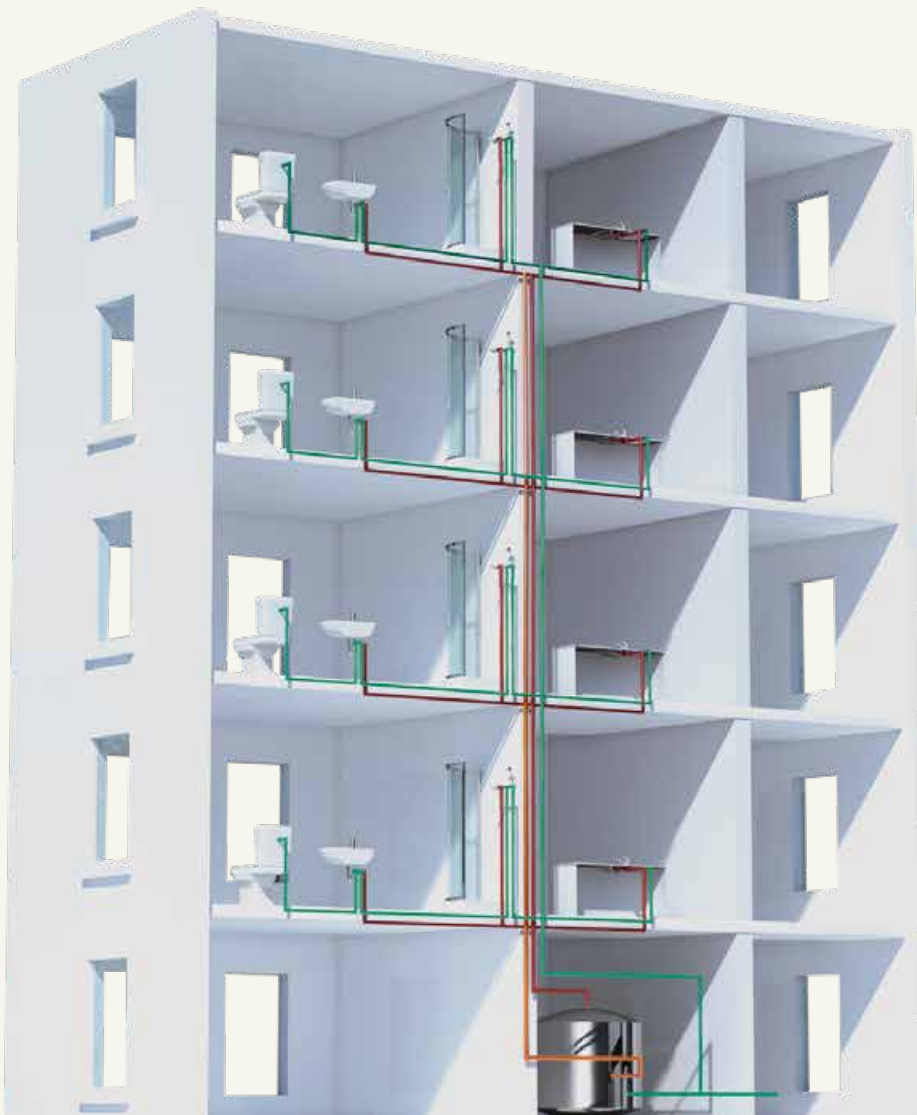


Fig.: Installation example in large buildings with controlled hot water circulation and looped cold water installation with periodic terminal flushing. Further variants with looped installation and cold water circulation are being discussed

Ensuring a High Quality of Drinking Water

Today various disinfectants are used for the chemical disinfection of drinking water systems. Because of test series and experiences from the past 15 years, some substances have prevailed in terms of their effectiveness; these substances are listed in the German Drinking Water Ordinance in the Part 1c. The following explanations are to be understood as recommendation for a chemical disinfection of drinking water systems and as a general guideline. With contaminated objects we recommend to take the necessary preparatory measures and carry out a shock disinfection. If required, a continuous disinfection should be considered.

In heavily contaminated drinking water systems, flushing respectively air pulse flushing can be considered as the first step. This flushing is carried out to mechanically detach and discharge the biofilms. A chemical disinfection is often taken into account as an additional measure.

Preparations for Conducting a Chemical Disinfection

6 steps that you must perform before a chemical disinfection

- 1 Analyse the drinking water quality (chemically and microbiologically)
- 2 Determine the type of wetted materials
- 3 Determine the hydraulic conditions of cold and hot water systems
- 4 Determine the operating conditions and critical connection points of the system
- 5 Determine existing water treatment at domestic water inlet
- 6 Assessment of the „intended use“ of the drinking water installation

If the expert's risk assessment of the drinking water system is positive with respect to all six points listed above, both flushing and chemical disinfection can be carried out. In particular, the following are observed: Section 11 and Part 1c of the German Drinking Water Ordinance as well as DVGW Bulletins W 291, W 557, W 229, W 551, W 290. At the same time, the practical experience of the past years with regard to effectiveness and material life are taken into account. Pipe materials, gunmetal valves and elastomeric gaskets are particularly crucial here, since especially shock disinfections may lead to water leakage after years of use. Thus, a number of conditions has to be taken into account before carrying out a shock disinfection.



Chemical Shock Disinfection

If the preventive measures as described above failed to clean the drinking water system properly, we recommend carrying out a chemical disinfection strictly observing the following conditions.

When shock disinfecting JRG valves and systems of the product lines JRG Sanipex Classic and JRG Sanipex MT, a sodium hypochlorite disinfectant may be used twice a year (according to the requirements described below) without impairing material life. Restrictions may arise due to drinking water ingredients and other parameters (pH value, conductivity), which should be determined in advance.

Material life of the GF JRG product lines is in no way affected and by shock disinfections (with anolyte neutral) as described above.

Recommendation for a Chemical Shock Disinfection

Designation	sodium hypochlorite NaOCl prepared in situ e.g. Hycleen Des 30	
CAS number	7681-52-9	
EINECS number	231-668-3	
Purity requirements	DIN EN 901 Table 1: Type 1 threshold for the contamination with chlorate (NaClO ₃): < 5,4 % (m/m) of active chlorine	
Permitted addition (free chlorine)	max. 50 mg/l	max. 100 mg/l
Temperature	5° to 65°C	5° to 65°C
Time	max. 24 h	max. 16 h
Concentration after completion of the treatment	min. 0,1 mg/l free chlorine	max. 0,3 mg/l free chlorine
By-products to be observed	trihalomethane, bromate	
Relevant DVGW Bulletins	DVGW W 291, W 296	
Note	Not comparable with sodium hydroxide solution, which is prepared using chlorine gas.	

Legend:

CAS = Chemical Abstracts Service Registry Number

EINECS = European Inventory of Existing Commercial Chemical Substances



Continuous Chemical Disinfection

The insufficient quality of drinking water at the domestic water inlet or limitations in the use of the object (reconstruction, conversion, maintenance work) may require a continuous disinfection to ensure a high quality of drinking water. Certain incidents leading to microbiologically contaminated drinking water as advised of by the drinking water suppliers call for timely measures. Depending on the extent of the incident, these measures may take months or years. Details have to be agreed on by the facility operators and the local Health Department.

On the basis of our long-term experience with cases in which a chemical disinfection was unavoidable, we recommend using a sodium hypochlorite disinfectant paying special attention to the operating conditions of the

drinking water system, since the disinfectant is only insufficiently distributed in case of low or irregular water consumption. In order for the disinfectant to be transported through the entire system, it is highly recommended to tap drinking water at least every three days (72 hours) or to ensure distribution with the help of an automatic flushing. This recommendation applies in particular to objects which are only temporarily or irregularly in use.

Before applying other disinfection techniques or disinfectants, we would advise you to contact GF JRG.

Recommendation for a Continuous Chemical Disinfection

Designation	sodium hypochlorite NaOCl prepared in situ e.g. Hycleen Des 30
CAS number	7681-52-9
EINECS number	231-668-3
Purity requirements	DIN EN 901 Table 1: Type 1 threshold for the contamination with chlorate (NaClO ₃): <5.4% (m/m) of active chlorine
Permitted addition (free chlorine)	max. 1,2 mg/l
Temperature	5° to 65°C
Time	continuous
Concentration at each tapping point	max. 0,3 mg/l free chlorine
By-products to be observed	trihalomethane, bromate
Relevant DVGW Bulletins	DVGW W 291, W 296
Note	Not comparable with sodium hydroxide solution, which is prepared using chlorine gas

Legend:

CAS = Chemical Abstracts Service Registry Number

EINECS = European Inventory of Existing Commercial Chemical Substances



Recommendations for the Preparation of the Disinfectant

In case of contaminated drinking water, preventive measures do often not last and particularly in cold drinking water systems continuous disinfection measures are indispensable. Here, it is important to choose an environmentally friendly and efficient disinfection technique. The Hycleen Des 30 provides a highly effective and easy way to maintain drinking water quality with a chemical disinfection using an electrochemically activated disinfectant. The disinfectant solution is produced in situ out of water and salt through diaphragm electrolysis. This process is fully in line with the principle of minimization; it features high antibacterial efficacy and low environmental impact caused by by-products. In addition, long-term tests have shown that the electrochemically activated disinfectant solution (when used correctly) has no negative impact on the service life of the GF JRG product line.

Furthermore, the Hycleen Des 30 is easy to handle and has low operating costs of 3 cents per 1000 litres of treated drinking water.

In future, it will be crucial whether measures such as a chemical disinfection can be carried out at any time to keep the contamination risk of drinking water as low as possible. Only drinking water systems that efficiently combine use and preventive measures, as the Hycleen Des 30 does, will be able to ensure a high quality of drinking water. Facility operators will hugely benefit from GF JRG drinking water installations and drinking water treatment techniques.

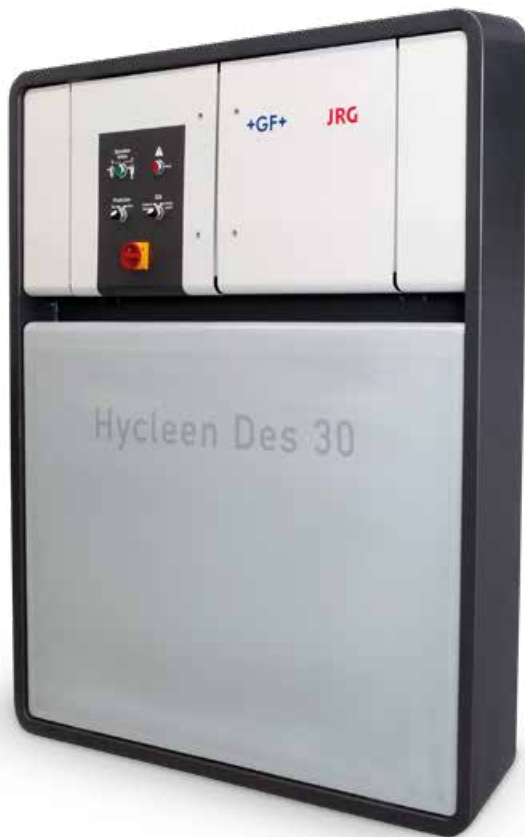


Fig.: The Hycleen Des 30 disinfection system has been used for many years and meets the strictest standards for the quality of drinking water.



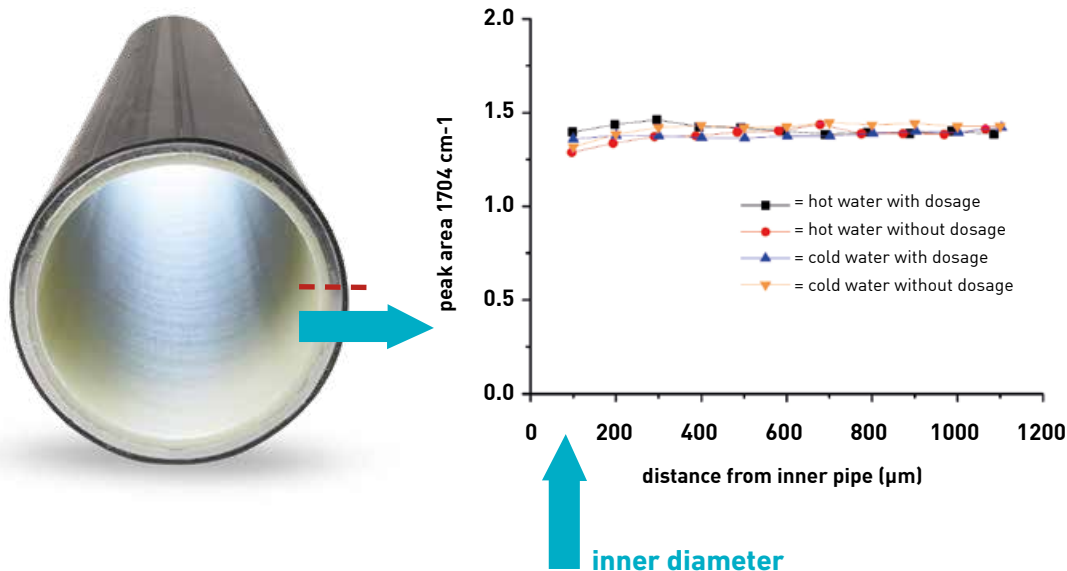
Life Cycle Verification When Using the Hyclean Des 30

Life cycle tests with high chemical and physical stresses over several years have shown no lifetime limitations of GF JRG products. The given example of a Sanipex MT pipe clearly shows the cross section and the stabiliser distribution more than 5 years into the test.

Life Cycle Test for JRG Sanipex MT 16

For the use of PE-X pipes in drinking water systems, small concentrations of stabilisers are added to the polyethylene. The stabilizers ensure that neither water ingredients nor the temperature damage the PE-X pipe. It is important that the stabiliser concentration is uniformly distributed over the entire wall thickness.

The diagram below shows the uniform stabilizer concentration from the inner diameter to the inner aluminum layer. The infrared spectrometer shows the quantitative amount of stabiliser concentration at 1704 cm^{-1} . The diagram shows the stabiliser concentration of the inner pipe with a cold water and hot water dosage of sodium hypochlorite, with a dose of 3 mg/l free chlorine being added. After 5 years, there is no evident difference in the stabiliser concentration caused by the different dosages.



Sources:

German Drinking Water Ordinance Section 11 and Part 1c (http://www.gesetze-im-internet.de/trinkkw_2001/BJNR095910001.html)

DVGW Bulletin W 291; 2000; Cleaning and disinfection of water distribution systems

DVGW Bulletin W 557; 2012; Cleaning and disinfection of drinking water systems

DVGW Bulletin W 229; 2008; Methods for disinfecting drinking water systems with chlorine and hypochlorite

DVGW Bulletin W 551; 2004; Drinking water heating and drinking water pipe systems - Technical measures to prevent the growth of legionella - planning, construction, operation and maintenance of drinking water installations

DVGW Bulletin W 290; 2005; Drinking Water Disinfection - operational and requirement criteria

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