GRUNDFOS
OXIPERM PRO

The Oxiperm Pro offers superior water disinfection technology for all types of water systems. It has the following, unique features:

• Destroys both free bacteria and biofilm
• Uses chlorine dioxide, which is extremely efficient, but has no effect on the taste and smell of the water
• The robust design of the Oxiperm Pro ensures high operational reliability and low maintenance costs
• User-friendly operation
• Easy installation with no interruption of the building’s water supply
The GRUNDFOS Oxiperm Pro System ensures effective disinfection of water in a series of application areas

Water disinfection is of great importance in all buildings with drinking water consumption, and particularly in buildings that supply shower and bathing facilities. Water disinfection is also essential in applications where water mist is sprayed into the air, for instance cooling towers and evaporative condensers.

Grundfos’ Oxiperm Pro system ensures safe, clean water to all its end users in buildings such as:
- Hotels
- Hospitals
- Sports and swimming facilities
- Fitness centres
- Wellness resorts
- Residential buildings

The problem
Naturally, the water we drink and shower in has to be clean if we are to stay healthy. Unfortunately, one of the most widespread health hazards in drinking water installations worldwide is connected to exceptionally resistant bacteria – legionella.

Legionella exist mainly in hot water systems with a low flow rate, areas of stagnation or badly serviced hot water tanks. A layer of slime in the water pipes called biofilm is the habitat for legionella and other microorganisms. The bacteria live, breed and thrive in biofilm in temperatures between 30 and 50°C and they constitute a severe health risk.

The solution
The Grundfos Oxiperm Pro system is the all round solution to the hazard of both legionella and other kinds of microorganisms. It offers the following unique benefits that remain unmatched by other disinfection methods:
- Works on both bacteria and biofilm
- Affects highly chlorine resistant germs
- Efficient in areas of the pipe system with no flow (dead ends)
- No effect on the taste and smell of the water
- Sustained release effect for long-term disinfection

Worldwide drinking water regulations require clean and healthy water free of:
- Bacteria (legionella, salmonella etc.)
- Viruses (hepatitis, polio, norovirus etc.)
- Parasites (giardia, cryptosporidium, entamoeba etc.)
- Fungus spores (yeast, moulds etc.)
What are legionella bacteria?
Legionella bacteria are the primary source of legionnaire’s disease – a potentially fatal disease, particularly for those with a weakened immune system. It is estimated that legionnaire’s disease is responsible for 15-20,000 deaths in Europe every year.∗

Legionella bacteria and the biofilm where they live and feed are highly resistant to most disinfection methods. That makes effective combat against them difficult, and their successful elimination calls for specific and highly specialised solutions.

The right solution is both tough and gentle
There are many approaches to fighting legionella bacteria and biofilm, but no approach is as efficient or gentle as the Grundfos Oxiperm Pro system. The system effectively battles legionella and biofilm without affecting the taste and smell of the water. By choosing Oxiperm Pro, you have made the right choice for the safety and comfort of the end consumers.

∗Source: Robert Koch Institute, Berlin, 2008
The chemistry of great benefits
The Oxiperm Pro system uses chlorine dioxide for the disinfection of water. This particular chemical compound presents a number of advantages that cannot be matched by any other disinfection method.

- **Removes both free legionella and biofilm**
  Legionella bacteria grow and reproduce in biofilm as does 90% of all bacteria in water systems. Biofilm is a layer of slime that exists in water pipes and especially in hot water tanks. Chlorine dioxide diffuses into the biofilm and destroys it from within, whereas other disinfectants only attack the surface of the film.

- **Water pH adaptable**
  With chlorine dioxide, no particular pH value is needed, which makes it an extremely flexible disinfectant.

- **Long-term effect**
  Chlorine dioxide has the best residual effect of all the available disinfection methods. It stays in the water system for several days, reaches into every crack of the pipe fittings, and even dissolves into dead end pipes with no water flow.

- **Digital dosing**
  The Oxiperm Pro is a digital dosing system which makes it flexible, cost effective and eliminates the risk of overdosing.

- **No effect on water taste and smell**
  Chlorine dioxide does not form the toxic chloramines and haloforms that are a by-product of chlorine-based disinfection methods. In effect, the water neither tastes nor smells of chlorine with the use of the Oxiperm Pro.

- **Low life cycle cost**
  Water disinfection with the Oxiperm Pro means reduced chemical use and reduced energy consumption. The chemical use is reduced due to the advanced batch-reaction technology and the high-precision flow measurements that adjust the amount of chemicals to the current flow giving the Oxiperm Pro an extremely low overall life cycle cost.

- **Compact design**
  The Oxiperm Pro has a built-in measuring application, which measures the residual chlorine in the water. It also has an integrated digital dosing pump making it an all-in-one compact solution.

- **No effect on water taste and smell**
  Chlorine dioxide does not form the toxic chloramines and haloforms that are a by-product of chlorine-based disinfection methods. In effect, the water neither tastes nor smells of chlorine with the use of the Oxiperm Pro.
Typical dosing rates in building applications are between 0.1 and 0.4 g/m³.

The exact quantity of required chlorine dioxide is defined by testing on-site. Samples are taken from the various water outlets in the building and tested for chlorine dioxide residual. Based on the residual amount, the unit settings can be adjusted. Contact your local Grundfos office for a detailed overview of the guidelines and regulations relevant to your project.

Example of calculation of maximum hourly flow rate in a 200-bed hotel

Annual water consumption: \( Q_{\text{year}} = 180 \text{ m}^3/\text{bed/year} \)

Consumption period: 365 days/year

Average daily consumption: \( Q_{\text{avg}} = \frac{Q_{\text{year}}}{365} = 0.5 \text{ m}^3/\text{bed/day} \)

Day factor \( f_d = 1.5 \)

Maximum daily flow rate: \( Q_{\text{max}} = 0.5 \times 1.5 = 0.75 \text{ m}^3/\text{bed/day} \)

Peak factor \( f_p = 4 \)

Maximum hourly flow rate per unit: \( Q_{\text{peak}} = 0.75 \times 4 / 24 = 0.125 \text{ m}^3/\text{bed/h} \)

Number of beds: \( n = 200 \)

Maximum hourly flow rate for the whole hotel: \( Q_{\text{peak}} = 200 \times 0.125 = 25 \text{ m}^3/\text{h} \) (hot and cold water)

Maximum hourly flow rate for the whole hotel: \( Q_{\text{peak}} = 25 \times 0.4 = 10 \text{ m}^3/\text{h} \) (hot water only)

Alternatively, use the quick glance flow chart to the right.

The required total consumption and maximum flow requirement depends on the building type. There is a big difference in annual water consumption, daily maximum consumption and the peak consumption in a block of flats compared to a five star hotel. If you have no reliable flow measurements in the building, the table below gives you an example of how to calculate peak water flow in various types of buildings in order to select the right Oxiperm Pro.

### Selection chart

- Example: 200 room hotel
- Oxiperm Pro 5 should be used for disinfection of hot water only

### Defining peak flow, \( Q_{\text{peak}} \)

<table>
<thead>
<tr>
<th>Building type</th>
<th>Unit</th>
<th>( Q_{\text{year}} ) [m³ per year]</th>
<th>Consumption period [days/year]</th>
<th>( Q_{\text{avg}} ) [m³/unit/day]</th>
<th>( f_d )</th>
<th>( Q_{\text{max}} ) [m³/unit/day]</th>
<th>( f_p )</th>
<th>( Q_{\text{peak}} ) [m³/unit/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential building</td>
<td>Residents (2.5 pers.)</td>
<td>183</td>
<td>365</td>
<td>0.5</td>
<td>1.3</td>
<td>0.65</td>
<td>1.7</td>
<td>0.046</td>
</tr>
<tr>
<td>Office buildings</td>
<td>Employee</td>
<td>25</td>
<td>250</td>
<td>0.1</td>
<td>1.2</td>
<td>0.12</td>
<td>3.6</td>
<td>0.018</td>
</tr>
<tr>
<td>Shopping centre</td>
<td>Employee</td>
<td>25</td>
<td>300</td>
<td>0.08</td>
<td>1.2</td>
<td>0.1</td>
<td>4.5</td>
<td>0.018</td>
</tr>
<tr>
<td>Supermarket</td>
<td>Employee</td>
<td>80</td>
<td>300</td>
<td>0.27</td>
<td>1.5</td>
<td>0.4</td>
<td>3.0</td>
<td>0.070</td>
</tr>
<tr>
<td>Hotel</td>
<td>Bed</td>
<td>180</td>
<td>365</td>
<td>0.5</td>
<td>1.5</td>
<td>0.75</td>
<td>4.0</td>
<td>0.125</td>
</tr>
<tr>
<td>Hospital</td>
<td>Bed</td>
<td>300</td>
<td>365</td>
<td>0.8</td>
<td>1.2</td>
<td>1.0</td>
<td>3.0</td>
<td>0.120</td>
</tr>
<tr>
<td>School</td>
<td>Pupil</td>
<td>20</td>
<td>200</td>
<td>0.1</td>
<td>1.3</td>
<td>0.13</td>
<td>1.5</td>
<td>0.054</td>
</tr>
</tbody>
</table>

Above figures are assumptions based on Danish legislation DS 442/1989 Code of Practice for common water-works. Calculation of water flow etc. may vary from country to country depending on national guidelines and legislation.
Injection of chlorine dioxide into the water system can be done wherever it is deemed suitable. If a total disinfection is desired, the injection point should be located where the water main enters the building.

In most cases, it is sufficient to treat only the hot water system where there is the highest risk of bacteria growth.

A five star hotel must deliver the very highest level of comfort and safety for its guests. Le Meridien Bristol in Warsaw opened in 1993 and relied on the expertise of Grundfos for all its installations. Grundfos provided circulation pumps, boosters and wastewater pumps. To ensure the guests’ protection from legionella bacteria, the hotel chose to install the Oxiperm Pro. As a result, the hotel can continue to provide world-class service, and the health and safety of its guests is secured.
**OXIPERM PRO**

**THE DETAILS**

- **Main water line**: Water flow to be treated with chlorine dioxide
- **Water meter**: Provides impulse or analogue signal for proportional dosing of chlorine dioxide
- **Injection point**: Dosing point of chlorine dioxide solution in water line
- **Sample water out-take**: Sample water for measurement of chlorine dioxide residual
- **Sample water re-feed**: Sample water for chlorine dioxide measurement is re-fed to avoid unnecessary water consumption
- **Chlorine dioxide measurement**: Measurement module that controls the chlorine dioxide residual in treated water
- **Supply water out-take**: Water supply for Oxiperm Pro
- **Supply water out-take**: Water supply for Oxiperm Pro
- **Sodium chlorite storage tank**: 30 litres standard container
- **Hydrochloric acid storage tank**: 30 litres standard container
- **Drip pans**: Containment for chemical tanks to avoid chemical spilling

**Legend**
- Water pipe / tube
- ClO₂ dosing line
- Signal line
At Grundfos CBS, we are always thinking buildings, and our products contribute to making buildings that can almost think for themselves. We do not just consider our products as stand-alone devices – we consider them an integral part of a living building whose purpose is to function in the best way possible for its inhabitants.

Grundfos CBS offers products across the full range of applications, including heating, air conditioning, waste water, booster systems, fire protection systems and district energy.

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