May 21, 2013

Evaluation of Fluoride Addition to Water System

Town of Wilton
Saratoga County, New York

Prepared for:

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EVALUATION OF FLUORIDE ADDITION TO WATER SYSTEM

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1.0 INTRODUCTION AND WATER SYSTEM DESCRIPTION

The Wilton Water and Sewer Authority (WWSA) has five (5) water supply sources. The water from the City of Saratoga is currently delivered with fluoride. This report will evaluate the other four (4) sources of water to determine the appropriate fluoridation systems, the storage requirements for fluoridation chemicals and the monitoring requirements for the fluoridation process.

This report will also identify the operational and capital cost for each of the four (4) proposed fluoride systems. Additionally, potential issues with introducing fluoridation addition, such as effects on taste, odor, public health and operator safety, will be discussed.

The four (4) water supply facilities are Fairways, Mulberry, Jones Road and the County Connection to the SCWA water system. The following is a summary of the typical flow rate ranges at each facility:

- Fairways well field: 100,000 to 400,000 GPD
- Mulberry well field: 100,000 to 1,000,000 GPD
- Jones Road well field: 250,000 to 1,000,000 GPD
- County Connection (SCWA): 300,000 to 500,000 GPD

The typical hardness for the three (3) groundwater supplies is less than 120 mg/l and less than 30 mg/l for the SCWA supply.

The water system serves approximately 8,068 people through 2,934 service connections.

The daily average of water treated and pumped into the distribution system is 1,000,000 gallons per day for all four (4) sites.

2.0 PROJECT JUSTIFICATION

According to the Centers for Disease Control (CDC), fluoride is very effective in preventing cavities. Since Americans have more access to fluoride sources presently than they did when fluoridation was first introduced in the United States, CDC recommends a level of 0.7 mg/l (parts per million) in water supplies. However, New York State Department of Health (NYSDOH) has not yet subscribed to the new value set by the CDC. The NYSDOH states that the optimal range is between 0.8 to 1.2 mg/l (parts per million); therefore, it is proposed that a concentration of 1.0 mg/l is used for this study.

Fluoride is currently added to the water system at the Saratoga City connection before it is delivered to the Town of Wilton.

Due to the health benefits and the fact that some parts of the water district currently have fluoridated water, this study was commissioned to establish the cost for adding fluoride systems to the other four (4) sources of water.

3.0 AFFECT OF FLUORIDE ON TASTE, COLOR AND ODOR

Fluoride in smaller concentrations, such as those that will be present in the water supply, is not shown to have any effect on the taste, color or odor of the drinking water. Water supplies normally vary in their taste, color and odor. Materials other than fluoride, such as total dissolved solids and organic contaminants, are primarily responsible for causing these effects in a water supply.

For additional information, refer to Appendix A, which includes a fluoride fact sheet that the Center for Disease Control (CDC) has compiled.

4.0 FLUORIDATION ALTERNATIVES AND QUANTITIES

There are three (3) basic alternatives when it comes to fluoridation of a water supply, which include the addition of fluorosilic acid, a sodium fluoride solution or a sodium silicofluoride solution. Fluorosilic acid and sodium fluoride are generally used more often as they are more cost effective. For this application, sodium fluoride has been selected.

The use of fluorsilic acid is not as feasible since a safety/emergency shower is required and there is insufficient room to install such equipment. An emergency eye wash station is required when sodium fluoride is used; therefore, eye wash stations will be installed within each facility.

For the quantity of sodium fluoride required, a purity of 96% was assumed for dry NaF. This would mean that the powder contained approximately 43.4% fluoride by weight and a 50 pound bag would contain 21.7 pounds of fluoride. If a 1 mg/l feed rate is used, the system would need 8.345 lbs/day of fluoride.

Sodium fluoride is readily available from Slack Chemical, which is a vendor the WWSA currently uses.

5.0 DESIGN PARAMETERS

Design parameters are based on NYSDOH regulations which include:

- Feeders shall be accurate to within five percent of any desired feed rate; scales, loss-of-weight recorders or liquid level indicators, as appropriate, shall be accurate to within five percent of the average daily change in reading shall be provided for chemical feeds,
- A fluoride solution shall be applied by a positive displacement pump having a stroke rate not less than 20 strokes per minute, and at a feed rate not less than 20 percent of the rated capacity of the feed pump,
- A spring opposed diaphragm type anti-siphon device shall be provided for all fluoride feed lines and dilution water lines,
- Except for constant flow systems, a device to measure the flow of water to be treated is required,
- The dilution water pipe shall terminate at least two pipe diameters above the solution tank,
- Water used for sodium fluoride dissolution shall be softened if hardness exceeds 75 mg/l as calcium carbonate,
- Fluoride solutions shall be injected at a point of continuous positive pressure or suitable air gap provided,
- The electrical outlet used for the fluoride feed pump shall have a nonstandard receptacle and shall be interconnected with the well or service pump,
- Saturators should be of the upflow type and be provided with a meter and backflow protection on the makeup water line.

6.0 CHEMICAL STORAGE AND EQUIPMENT SELECTION

Chlorine and sodium fluoride can be stored together. Chemicals will be stored in containers which have capacities of 150 gallons or less. Some of the existing chlorine tanks will be replaced with smaller tanks. A fluoride saturator, pump and eye wash station will be installed at each facility.

The fluoride saturator will have an automatic solution level control and an up-flow design. The integrally mounted liquid level switch controls the solenoid valve operation to maintain a proper solution level in the tank. The distributor tube assembly supplies fresh water to a bed of sodium fluoride at the tank bottom. Water dispersed by the distributor tubes "flows up" through and dissolves the sodium fluoride powder to provide a saturated 4% solution.

The fluoride pump will be mounted on the wall next to the saturator. Refer to Appendix B, "Proposed Equipment", for additional product information for the saturator, chemical feed pump, fluoride probe and transmitter.

7.0 DOH REQUIREMENTS

7.1 Initial Setup

The system must be in compliance with NYS law 1100-A Fluoridation; refer to excerpt below:

§ 1100-a. Fluoridation. 1. Notwithstanding any contrary provision of law, rule, regulation or code, any county, city, town or village that owns both its public water system and the water supply for such system may by local law provide whether a fluoride compound shall or shall not be added to such public water supply.
2. Any county, wherein a public authority owns both its public water system and the water supply for such system, may by local law provide

whether a fluoride compound shall or shall not be added to such public water supply.

Thus, the Wilton Water and Sewer Authority (WWSA) has the authority to add fluoride to drinking water by a vote of its water board after conducting a public comment period.

7.2 Monthly Reporting

The New York State DOH requires daily monitoring of fluoride levels and monthly samples, which are sent to the state lab for analysis.

It is recommended that fluoride at each facility will be continuously monitored using a fluoride probe that will send a signal to an existing multi-channel transmitter, which is capable of accepting an additional signal. The signal will then be transmitted to the existing SCADA system, which will be programmed and the SCADA screens updated to allow continuous monitoring.

8.0 COST ESTIMATE

8.1 Capital

Based on installing the fluoride equipment in the existing chemical rooms, which will require minimal work to the various buildings, the following conceptual cost opinions were developed to deliver and monitor fluoride the water supply:

- Fairways Site: $16,000
- Mulberry Site: $18,000
- Jones Road Site: $18,000
- County Connection: $15,000
- Contractual Costs: $21,000

Subtotal: $88,000

- Contingency at 20%: $18,000
- Engineering: $20,000

Total: $126,000

Appendix C, "Conceptual Cost Opinions – Fluoride Upgrades", includes a more detailed breakdown of estimated project costs.

8.2 O&M

Anticipated additional operation and maintenance costs associated with this project are summarized as follows:

- $7,300 for Sodium Fluoride
- $3,600 for annual probe replacement
- $2,400 for additional laboratory costs

Total estimated O&M cost is $13,300 per year.

FIGURES

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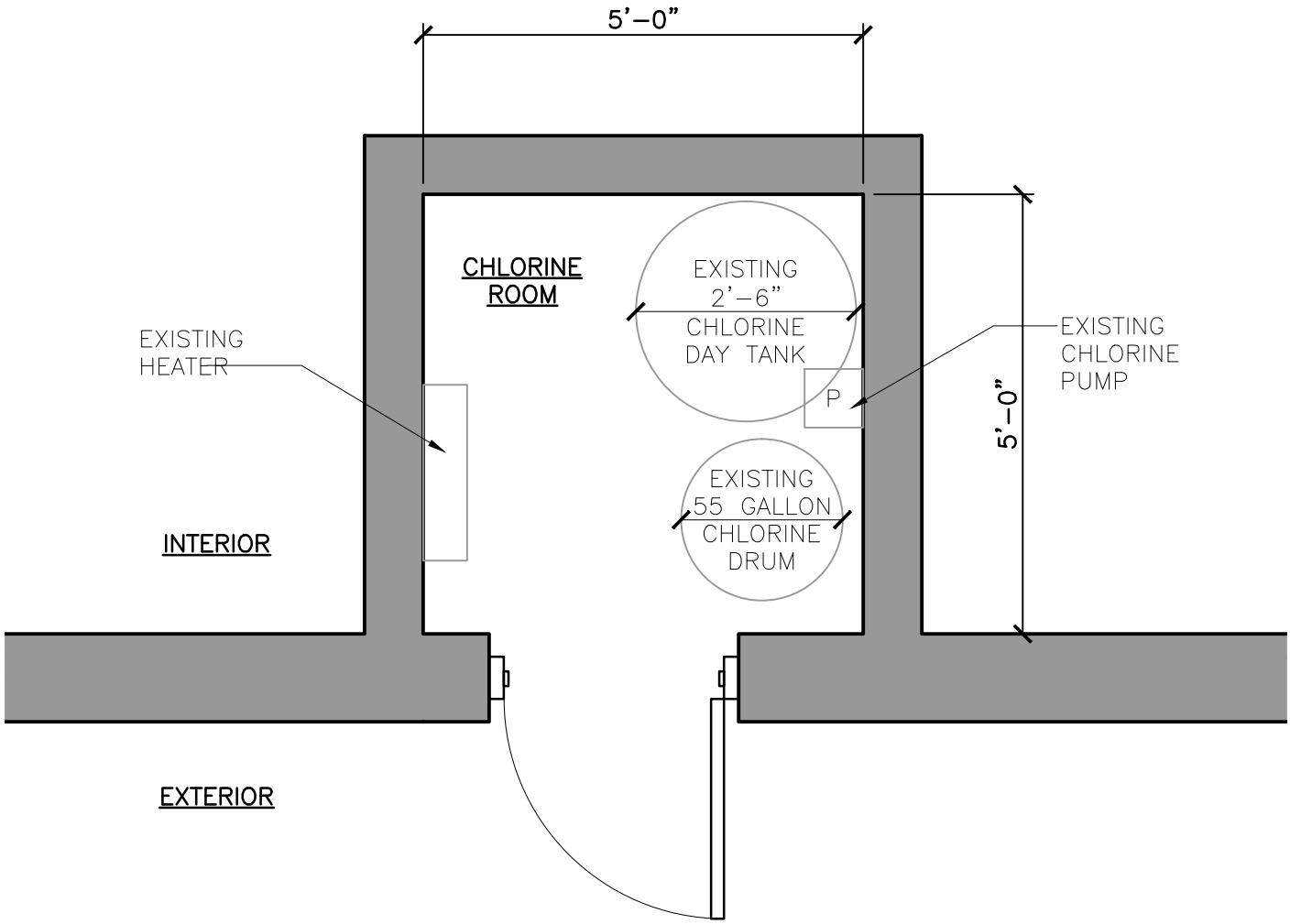

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FAIRWAYS PLANT
EXISTING CONDITIONS
WILTON WATER AND SEWER AUTHORITY
FACILITY UPGRADES

TOWN OF WILTON | SARATOGA COUNTY, NEW YORK

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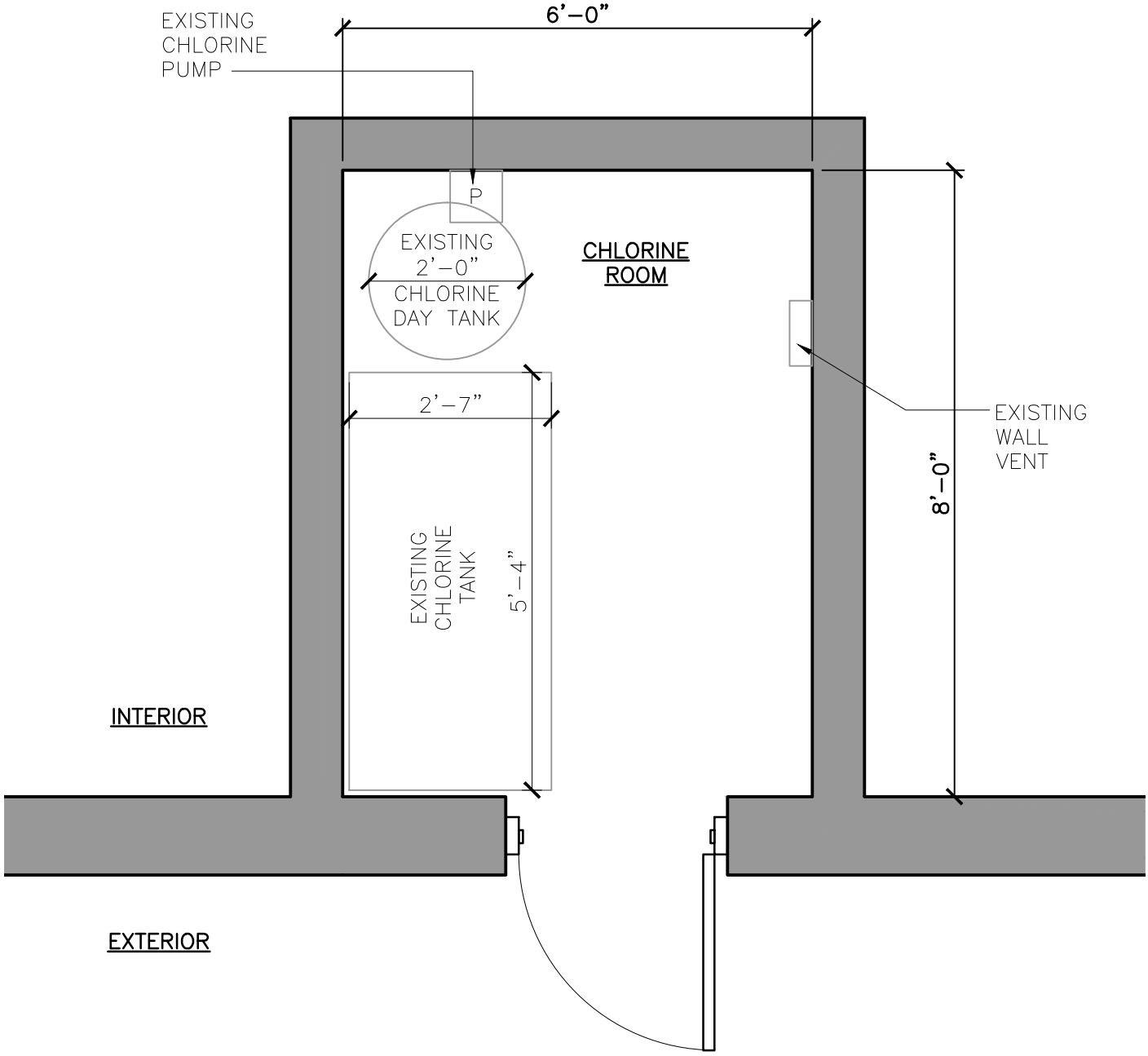

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MULBERRY PLANT
EXISTING CONDITIONS
WILTON WATER AND SEWER AUTHORITY
FACILITY UPGRADES

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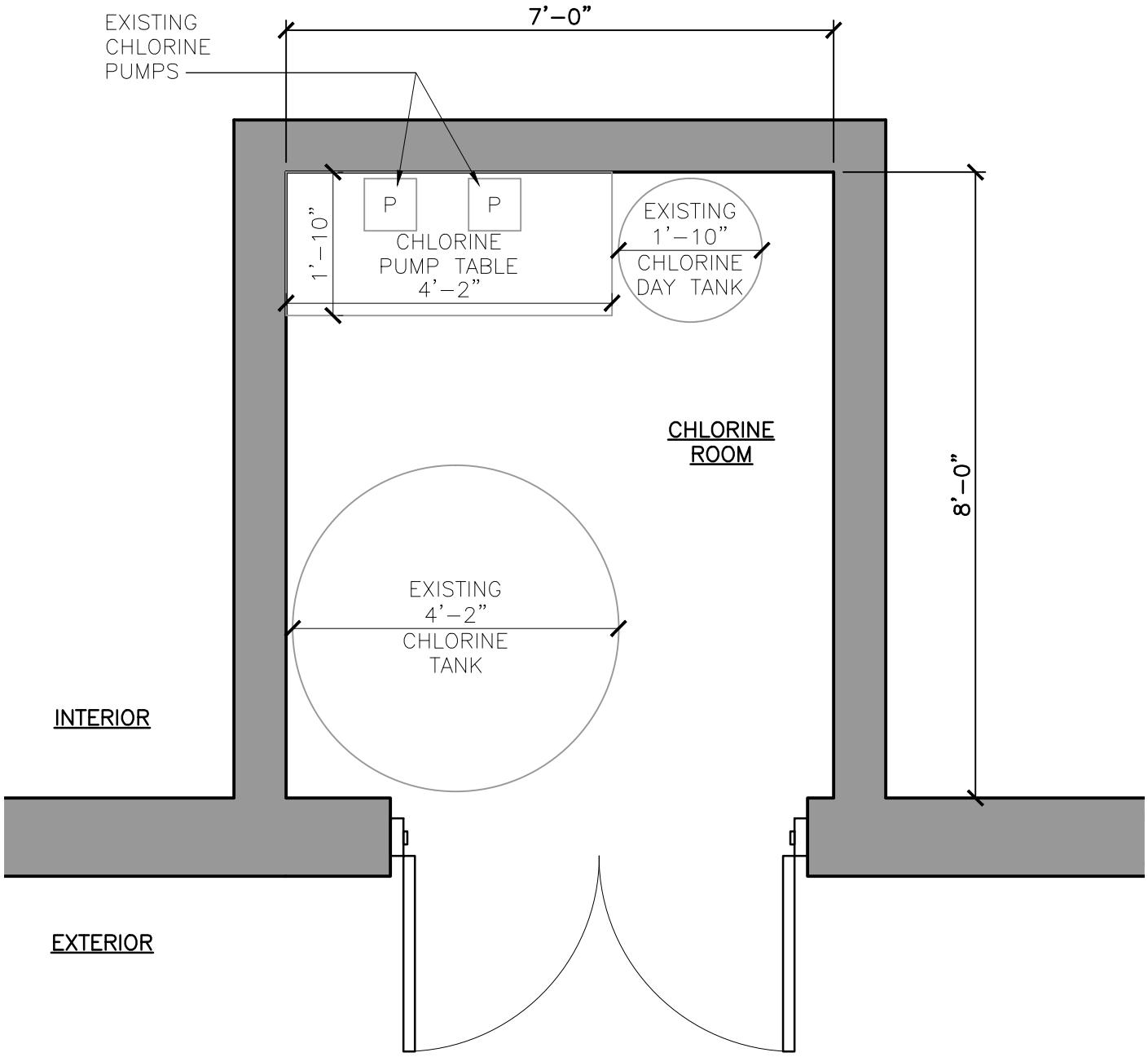

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JONES ROAD PLANT
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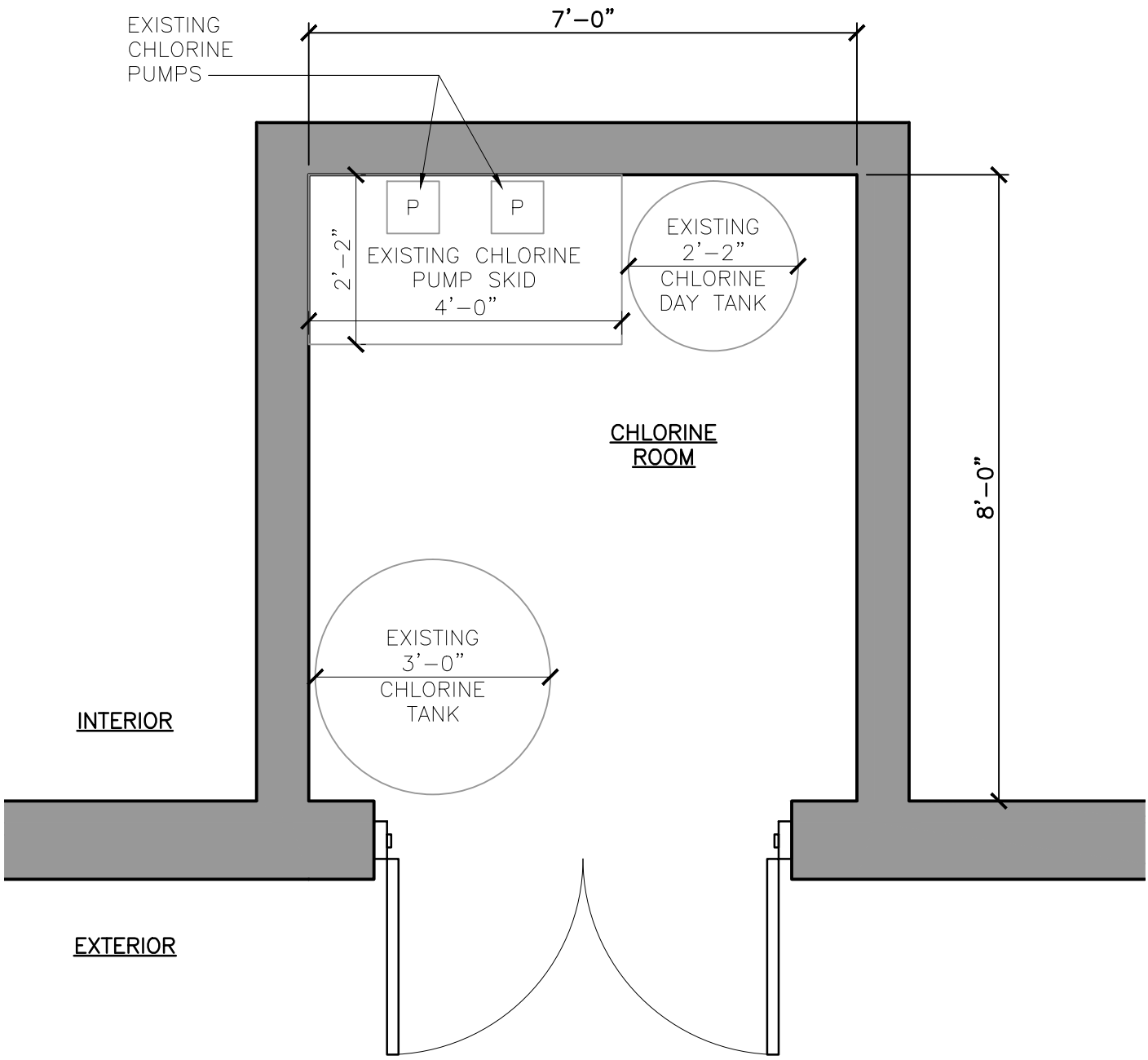

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COUNTY CONNECTION PLANT
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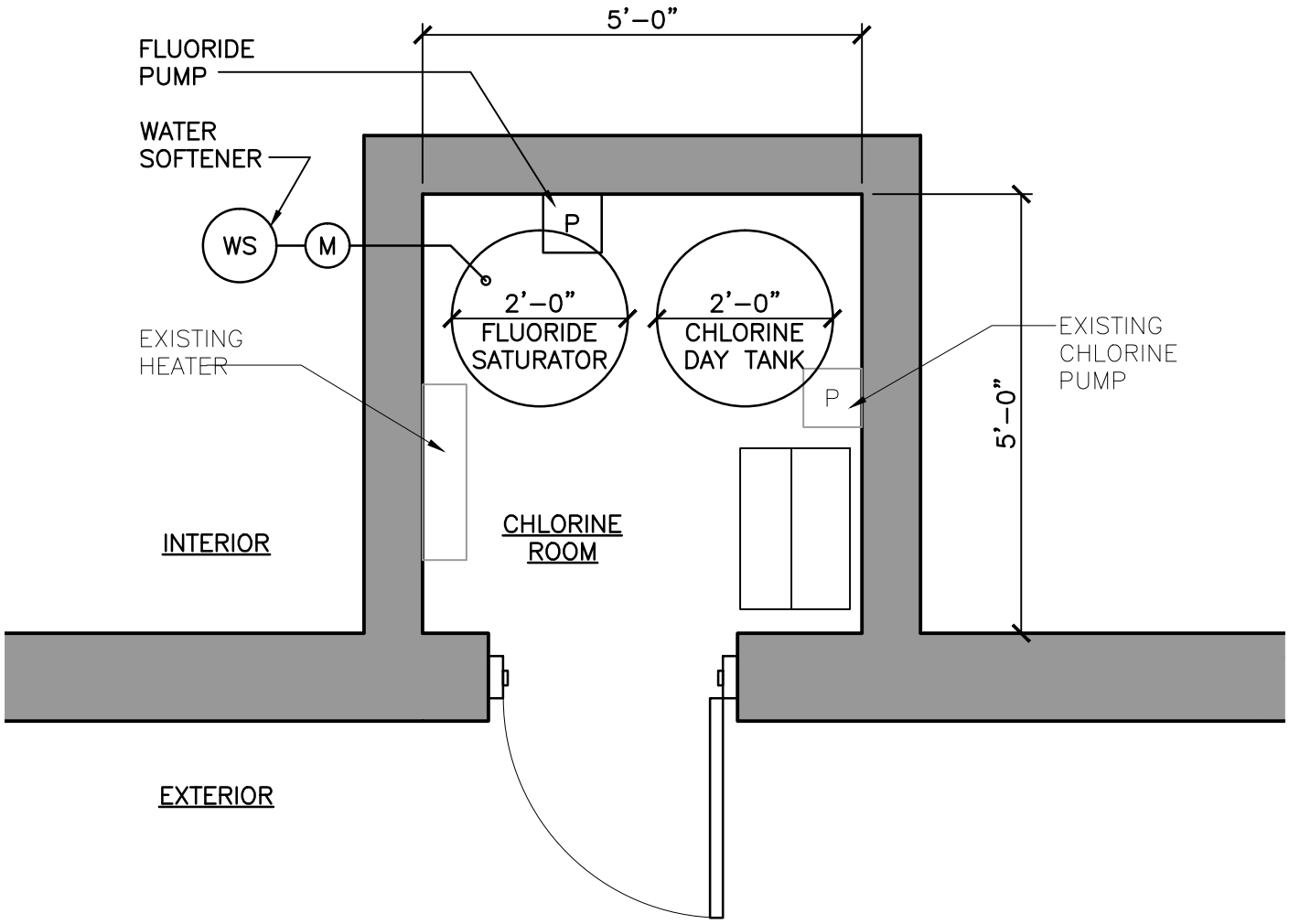

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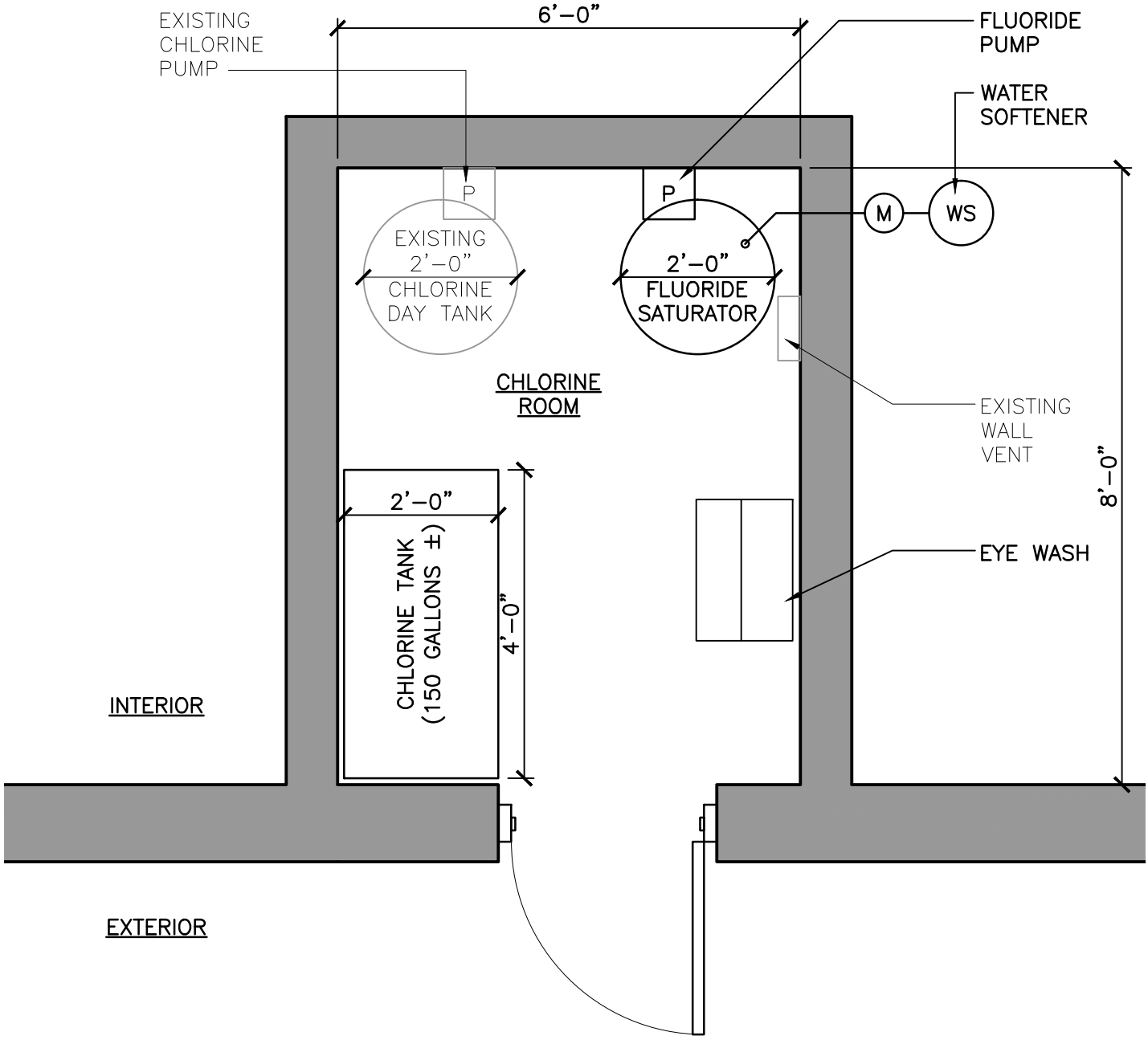

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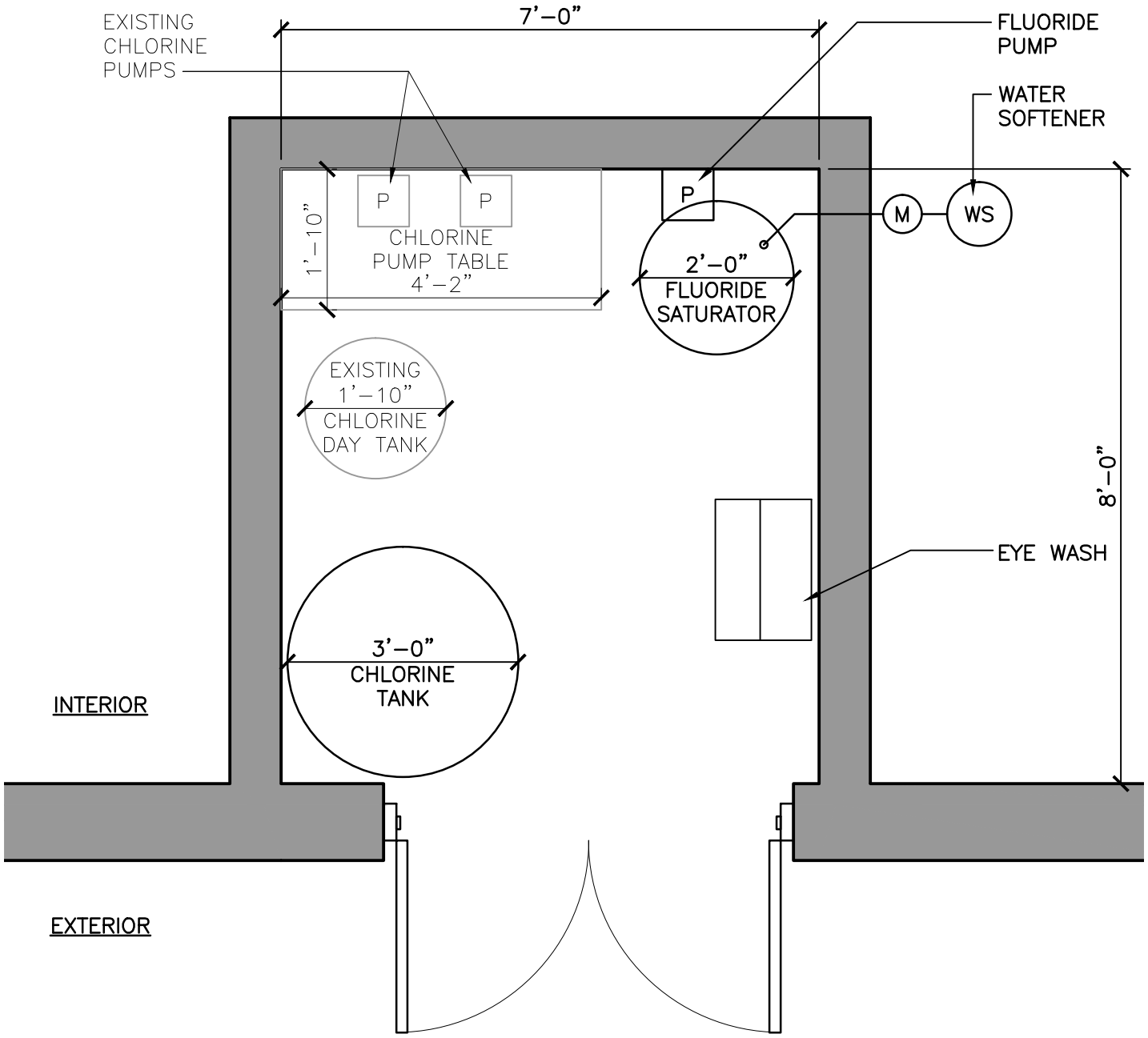

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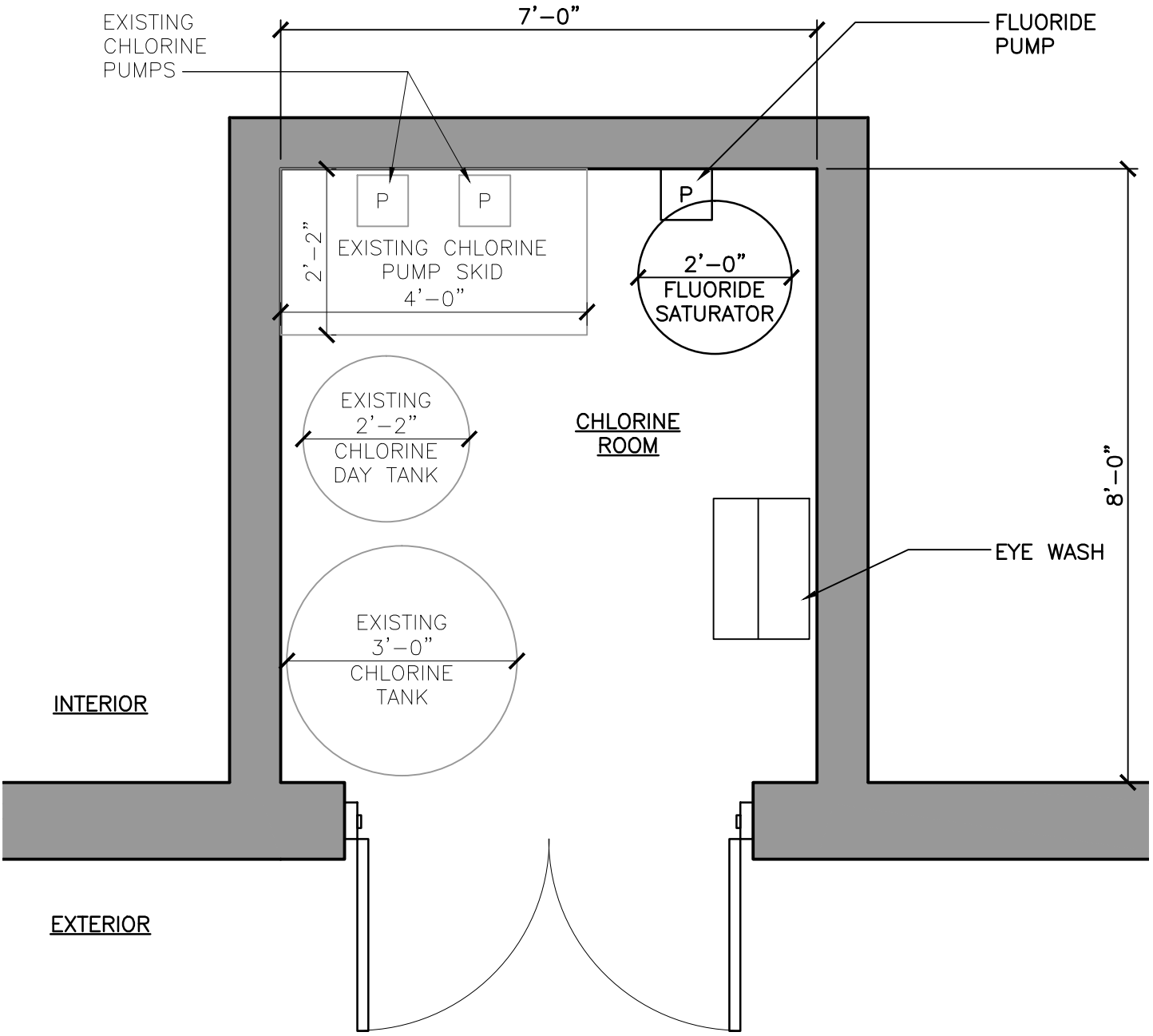

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APPENDIX A

CDC Community Water Fluoridation: Questions and Answers

Community Water Fluoridation: Questions and Answers

The U.S. Department of Health and Human Services is proposing a change to the recommendation for the optimal fluoride level in drinking water to prevent tooth decay. The new recommendation, 0.7 milligrams of fluoride per liter of water, replaces the previous recommended range of 0.7 to 1.2 milligrams per liter. There are several reasons for this change, including that Americans have access to more sources of fluoride than they did when water fluoridation was first introduced in the United States. The new guidance will update and replace original recommendations provided in 1962 by the U.S. Public Health Service.

This fact sheet provides information on community water fluoridation, as well as current federal activities to update guidance and regulations on community water fluoridation.

Fluoride in drinking water and toothpaste more generally:

Potential adverse health effects from overexposure:

18. **Are children or adults exposed to too much fluoride?** (#18)
19. **Who is at risk for excessive fluoride exposure?** (#19)
20. **What are the effects of excess levels of fluoride and why are they different for children and adults?** (#20)
21. **Is my child getting an appropriate amount of fluoride from drinking water and tooth brushing?** (#21)
22. **What are the drinking water standards for maximum levels of fluoride? What do you mean by an MCL, an MCLG, and a secondary standard for fluoride? What is the difference?** (#22)
23. **Has the safety of fluoridation been evaluated?** (#23)

What people can do:

24. **What should I do to limit my exposure to fluoride?** (#24)
25. **Should my children stop brushing their teeth with fluoride toothpaste?** (#25)
26. **Should I reduce the number of times I brush my teeth daily?** (#26)
27. **Should I refuse fluoride treatments at the dentist?** (#27)
28. **If I am drinking water with fluoride, why do I also need to brush with toothpaste that contains fluoride?** (#28)
29. **If they both contain fluoride, how can they work differently?** (#29)
30. **Does toothpaste contain too much fluoride to be recommended for children?** (#30)
31. **Are there methods I can use to remove fluoride from my drinking water at home? For example, boiling or use of commercially available water filters and units?** (#31)
32. **Is there fluoride in infant formula? Should I try to remove fluoride from infant formula?** (#32)
33. **Is fluoride present in mouthwash and dental whitening products?** (#33)
34. **Does bottled water contain fluoride?** (#34)

There is some potential for developing dental fluorosis when children consume fluoride during the time when teeth are forming under the gums (birth through age 8). To help prevent both tooth decay and dental fluorosis, the Centers for Disease Control and Prevention (CDC) recommends the following:

For parents: Children younger than 6 years have a poor swallowing reflex and tend to swallow much of the toothpaste on their brush. Toothpaste that is swallowed (but not toothpaste that is spit out) contributes to a child's total fluoride intake. Therefore:
As soon as the first tooth appears, begin cleaning by brushing without toothpaste with a small, soft-bristled toothbrush and plain water after each feeding. Begin using toothpaste with fluoride when the child is 2 years old. Use toothpaste with fluoride earlier if your child's doctor or dentist recommends it.

- Do not brush your child's teeth more than 2 times a day with a fluoride toothpaste,
- Apply no more than a pea-sized amount of toothpaste to the toothbrush, and
- Supervise your child's tooth brushing, encouraging the child to spit out toothpaste rather than swallow it. Additional information is available on-line: **http://www.cdc.gov/oralhealth/publications/factsheets/brushup.htm** (http://www.cdc.gov/oralhealth/publications/factsheets/brushup.htm)
- If your child's pediatrician or dentist prescribes a fluoride supplement (or vitamin supplement that contains fluoride), ask him or her about any risk factors your child has for decay and the potential for dental fluorosis. If you live in an area with fluoridated water, fluoride supplements are not recommended.
- You can use fluoridated water for preparing infant formula. However, if your baby is exclusively consuming infant formula reconstituted with fluoridated water, there is an increased potential for mild

dental fluorosis. Additional information can be found in a CDC fact sheet on infant formula: **http://www.cdc.gov/fluoridation/safety/infant_formula.htm** (http://www.cdc.gov/fluoridation/safety/infant_formula.htm)

For health professionals:

- Fluoride supplements can be prescribed for children at high risk of tooth decay whose primary drinking water has a low fluoride concentration. For children under 8, weigh the risk for decay without fluoride supplements, the decay prevention offered by supplements, and the potential for dental fluorosis.
- Counsel parents and caregivers on the use of fluoride toothpaste by young children, especially those younger than 2 years. Fluoride toothpaste is a cost-effective way to reduce the prevalence of tooth decay. However, because they do not have a well-developed swallowing reflex and may like the taste of the toothpaste, young children often swallow a large portion of the toothpaste put on their brush.
- The prescription dose of fluoride supplements should be consistent with the schedule established by the American Dental Association, the American Academy of Pediatric Dentistry, and the American Academy of Pediatrics.

1. What is fluoride?

Fluoride is a naturally occurring mineral that is proven to protect against tooth decay.

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2. Why is fluoride added to water and toothpaste?

Fluoride's action in preventing tooth decay benefits both children and adults throughout their lives. The health benefits of fluoridation are—

- Fewer cavities and less severe cavities.
- Less need for fillings and tooth extractions.
- Less pain and suffering associated with tooth decay.

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3. How does fluoride work to prevent tooth decay?

Fluoride works by stopping or even reversing the tooth decay process. It keeps tooth enamel strong and solid. Tooth decay is caused by certain bacteria in the mouth. When a person eats sugar and other refined carbohydrates, these bacteria produce acid that removes minerals from the surface of the tooth. Fluoride helps to remineralize tooth surfaces and prevents cavities from continuing to form.

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4. What is community water fluoridation?

Almost all water contains some naturally occurring fluoride, but usually at levels too low to prevent tooth decay. Many communities choose to adjust the fluoride concentration in the water supply to a level beneficial to reduce tooth decay and promote good oral health. This practice is known as community water fluoridation. Given the dramatic decline in tooth decay during the past 65 years, the Centers for Disease Control and Prevention (CDC) named water fluoridation one of **Ten Great Public Health Interventions of the 20th Century** (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm4850bx.htm) .

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5. Why is the Department of Health and Human Services (HHS) developing new recommendations for community water fluoridation?

Sources of fluoride have increased since the early 1960s. At that time, drinking water and food and beverages prepared with fluoridated water accounted for nearly all of an individual's fluoride intake. Today, water is just one of several sources of fluoride. Other sources include dental products such as toothpaste and mouth rinses, prescription fluoride supplements, and professionally applied fluoride products such as varnish and gels. Recognizing that it is now possible to receive enough fluoride with slightly lower levels of fluoride in water, the HHS set out to develop new recommendations for community water fluoridation.

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6. How is HHS developing new recommendations?

In September 2010, the Department of Health and Human Services convened a panel of scientists from the across the U.S. government to review new information related to fluoride intake and to develop new recommendations for community water fluoridation.

The scientists reviewed the best available information on: the prevalence and trends in dental caries, water intake in children in relation to outdoor air temperature, changes in the percentage of U.S. children and adults with dental fluorosis, and the U.S. Environmental Protection Agency's (EPA) new assessments of cumulative sources of fluoride exposure and risks of children developing severe dental fluorosis.

This new information led HHS to propose changing the recommended level for community water systems to 0.7 milligrams per liter.

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7. How were the recommended levels previously set for fluoride in drinking water?

In 1962, based on scientific studies showing that fluoride reduces tooth decay, the U.S. Public Health Service recommended the amount of fluoride in drinking water range from 0.7 to 1.2 milligrams per liter. Scientists set the range by taking into account different levels of children's fluid intake according to the average annual temperature in different regions of the United States—less fluoride was added in warmer, southern climates where it was believed that people drank more water, and more was added in cooler, northern climates where it was believed that people drank less. Over the past several decades, many factors, including the advent of air conditioning, have reduced geographical differences in water intake.

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8. How does fluoride get into tap water?

Fluoride can occur in drinking water naturally as a result of the geological composition of soils and bedrock. Some areas of the country have high levels of naturally occurring fluoride. Fluoride can also be added to community drinking water supplies as a public health measure for reducing cavities. The decision whether or not to add fluoride to drinking water is made at the state or local level. Consumers served by community water systems who wish to learn about the fluoridation of their drinking water should visit the CDC's "My Water's Fluoride" Web site at **http://apps.nccd.cdc.gov/MWF/Index.asp** (http://apps.nccd.cdc.gov/MWF/Index.asp) .

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9. Does my community water system add fluoride to the water?

If you have questions about whether your community has fluoridated water, you can call your community water system. If you live in one of the 39 states that participate in the CDC's **"My Water's Fluoride"** (http://apps.nccd.cdc.gov/MWF/Index.asp) program, you can go online and find information on your water system's fluoridation status. The best way to find the fluoride level of your local community water system is to contact your water utility provider for more information. Consumers can find the name and contact information of the water utility on their water bill.

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10. Why is EPA's drinking water standard (referred to as the MCL or MCLG) different than HHS' recommended optimal fluoridation level for community drinking water systems?

EPA's drinking water standard differs from HHS' recommended optimal fluoridation level because the two benchmarks have different purposes and are set under different authorities.
TThe EPA's enforceable standard for the highest level of fluoride that is allowed in public water supplies is 4.0 milligrams per liter, and is set to protect against risks from exposure to too much fluoride. The HHS proposed recommended optimal level of 0.7 milligrams per liter is set to promote public health benefits of fluoride for preventing tooth decay while minimizing the chance for dental fluorosis.

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(#top) **11. What is dental fluorosis?**

Dental fluorosis is a change in the appearance of the tooth's enamel. It can result when children regularly consume higher-than-recommended amounts of fluoride during the teeth forming years, age 8 and younger. Most dental fluorosis in the U.S. – about 92 percent – is very mild to mild, appearing as white spots on the tooth surface that in many cases only a dental professional would notice. Moderate and severe forms of dental fluorosis, which are less common, cause more extensive enamel changes. In the rare, severe form, pits may form in the teeth. The severe form rarely occurs in communities where the level of fluoride in water is less than 2 milligrams per liter.

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(#top) **12. Since the optimal level of 0.7 milligrams per liter of fluoride is a "recommended" level (i.e., not a nationwide level or EPA enforceable level) in community drinking water systems, how do I know whether my community has or will reduce the level of fluoride in my drinking water? Does it have to?**

This optimal level recommendation is voluntary. If your local water system adds fluoride to the water, reducing the level is a simple process that can be completed almost immediately, although it may be several days before the entire water system is at the new level. If you want the most up-to-date information about the current fluoride level in your water, contact your local water system.

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13. Why has exposure to fluoride increased?

Exposures to fluoride have increased since the early 1960s. At that time, drinking water and food and beverages prepared with fluoridated water accounted for nearly all of an individual's fluoride intake. Today, exposure to fluoride comes from more sources including fluoridated dental products such as toothpaste and mouthwash, as well as the voluntary addition of fluoride to drinking water, which some systems do as a public health measure for reducing tooth decay.

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14. In addition to water, what are other specific sources of fluoride?

Fluoridated toothpaste is another main source of fluoride intake. Other fluoride-containing dental products are applied or prescribed by a health care professional such as gels, varnishes, pastes, and restorative materials. These products are used only occasionally on the outside of the tooth and do not contribute much to the total intake of fluoride. Small amounts of fluoride can also come from industrial emissions, pharmaceuticals, and pesticides.

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15. Given that we get fluoride from other sources, is it still beneficial to fluoridate drinking water?

Yes, water fluoridation is beneficial for reducing and controlling tooth decay and promoting oral health in children and adults. Recent estimates of reductions in tooth decay can be credited to community water fluoridation. Fluoride in drinking water provides some protection from tooth decay to all people who drink fluoridated water or eat food or drink beverages prepared in areas with fluoridated water. Additional information is available online at **http://www.thecommunityguide.org/oral/fluoridation.html** (http://www.thecommunityguide.org/oral/fluoridation.html) .

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16. Why does HHS think that 0.7 milligrams per liter is appropriate?

HHS has reviewed extensively the scientific literature on the relationship between fluoride and oral health. The optimal level of fluoride in drinking water provides enough fluoride to prevent tooth decay in children and adults while limiting the possibility for children to develop dental fluorosis in teeth that are forming under the gums. Analyses of national survey data show a gradual decline in tooth decay as fluoride content in water increases from very low levels to the recommended level of 0.7 milligrams per liter. However, there were limited changes in tooth decay as the level of fluoride in drinking water increased to 1.2 milligrams per liter. In contrast, the percentage of children with dental fluorosis increased as the fluoride concentration in water increased.

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17. What are the adverse health effects of excessive fluoride exposure?

Children under age 8 and younger exposed to excessive amounts of fluoride have an increased chance of developing pits in the tooth enamel. Excessive consumption of fluoride over a lifetime may increase the likelihood of bone fractures, and may result in effects on bone leading to pain and tenderness, a condition called skeletal fluorosis. Severe skeletal fluorosis is a rare condition in the United States. The EPA exposure analysis suggests that the effects on bone in adults are of greatest concern for those living in areas with high natural background levels of fluoride and favoring beverages, such as tea, that are high in fluoride.

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18. Are children or adults exposed to too much fluoride?

Based on the data evaluated in this risk assessment, EPA concludes that it is likely that some children 8 and younger are exposed to too much fluoride at least occasionally while their teeth are forming because of their high fluid intake relative to their body weight and/or because of high natural levels of fluoride in their local drinking water. The impact of overexposure on the risk for pitting of enamel in one or more teeth depends on the frequency and duration of the overexposures.

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19. Who is at risk from excessive fluoride exposure?

Children are most likely to be affected by excessive exposure to fluoride because it impacts teeth while they are still in formative phases (birth through formation of the wisdom teeth). EPA's risk assessment compared age-specific exposure estimates to the fluoride dose associated with pitted enamel and found that children 8 and younger may be those most at risk. The maximum dose that is protective for children will also protect adults from long-term effects on bone.

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20. What are the effects of excess levels of fluoride and why are they different for children and adults different?

Adults exposed to excessive consumption of fluoride over a lifetime may have increased likelihood of bone fractures, and may result in effects on bone leading to pain and tenderness. For effects to teeth, children are

most likely to be affected by excessive exposure to fluoride because it impacts teeth while they are still in formative phases. Children aged 8 years and younger exposed to excessive amounts of fluoride have an increased chance of developing pits in the tooth enamel, along with a range of cosmetic effects to teeth. For prevention of tooth decay, the beneficial effects of fluoride extend throughout the life span.

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21. Is my child getting an appropriate amount of fluoride from drinking water and tooth brushing?

Yes, if you and your child are among the 196 million Americans who receive their water from an optimally fluoridated community water system (0.7 to1.2 milligrams per liter) and you follow guidelines in your child's toothbrushing, then it is highly unlikely that your child is receiving too much fluoride. CDC recommends that children under 6 who are using fluoride toothpaste should use a small, pea-sized amount on the brush, spit out the excess paste, and rinse well after brushing. Begin using toothpaste with fluoride when your child is 2 years old. Use toothpaste with fluoride earlier only if your child's doctor or dentist recommends it. You can discuss the correct use of fluoride treatments and fluoride-containing toothpaste with your child's dentist. In addition, you can go to CDC's website to learn how young children can use fluoride-containing products to prevent dental fluorosis. See **Brush Up on Healthy Teeth** (http://www.cdc.gov/oralhealth/publications/factsheets/brushup.htm) .

In some regions in the U.S., community drinking water and home wells can contain levels of naturally occurring fluoride that are greater than the optimal levels recommended by the CDC for prevention of tooth decay. EPA currently has a non-enforceable recommended guideline for fluoride of 2.0 mg/L that is set to protect against cosmetic effects. If your home is served by a water system that has fluoride levels exceeding this recommended guideline, current EPA recommendations are that children should be provided with alternative sources of drinking water.

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22. What are the drinking water standards for maximum levels of fluoride? What do you mean by an MCL, an MCLG, and a secondary standard for fluoride? What is the difference?

The current enforceable drinking water standard for fluoride is 4.0 mg/L. This is the maximum amount that is allowed in water from public water systems, also called the Maximum Contaminant Level (MCL). The MCL is set to be as close to the public health goal as EPA finds may be achieved with the use of the best available technology, taking cost into consideration.
The public health goal, called a Maximum Contaminant Level Goal (MCLG), is not enforceable and is based solely on possible health risks and exposure over a lifetime. For fluoride, analytical methods or treatment technology do not pose any limitation so the MCL currently equals the MCLG of 4.0.

A secondary standard is a non-enforceable guideline to regulate contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color of drinking water). EPA recommends secondary standards to water systems but does not require systems to comply. For fluoride, the secondary standard is 2.0 mg/L.

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23. Has the safety of community water fluoridation been evaluated?

The safety and effectiveness of fluoride at levels used in community water fluoridation has been thoroughly documented by scientific and public health organizations using scientific reviews and expert panels. These expert panels consist of scientists from the United States and other countries with expertise in various health and scientific disciplines, including oral health, medicine, biophysics, chemistry, toxicological pathology, and epidemiology. Experts have weighed the findings and the quality of the available evidence and found that the weight of peer-reviewed scientific evidence does not support an association between water fluoridation and any adverse health effect or systemic disorders.

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24. What can I do to limit my exposure to fluoride?

Talk with your dentist about the best use of fluoride to prevent tooth decay. In adults in the U.S., there is little concern about unwanted health effects even from the combined level of fluoride from all sources. The main sources of fluoride intake for a child are from swallowing toothpaste and from water. Fluoride toothpaste is effective for preventing tooth decay and does not contribute to fluorosis unless it is swallowed. Because children under 6 have poor control of their swallow reflex, they tend to swallow much of the toothpaste on their brush. Parents or caregivers should supervise their child's tooth brushing, ensuring that that the child uses only a small pea-sized amount of paste, spits out the excess paste, and rinses well after brushing.

Water fluoridation is beneficial for reducing and controlling tooth decay and promoting oral health in children and adults. Recent estimates of reductions in tooth decay can be credited to community water fluoridation. You can check with your local water supplier to see how much fluoride is in your drinking water.

Consumers served by private wells may want to have their water tested by a state certified laboratory. You can find one by contacting your state water certification officer. Contact information for your state can be found at **http://water.epa.gov/scitech/drinkingwater/labcert/** (http://water.epa.gov/scitech/drinkingwater/labcert/)

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25. Should my children stop brushing their teeth with fluoride toothpaste?

Children over 2 years old should continue to brush their teeth with their usual fluoride containing toothpaste. Questions specific to your own child should be discussed with your child's dentist or pediatrician. See parent tips at **Brush Up on Healthy Teeth** (http://www.cdc.gov/oralhealth/publications/factsheets/brushup.htm) .

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26. Should I reduce the number of times I brush my teeth daily?

Continue to brush your teeth at least twice a day. Adults and children 2 years of age and older should brush their teeth preferably after each meal or at least twice a day, or as directed by a dentist or doctor.

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27. Should I refuse fluoride treatments at the dentist?

Your dentist will recommend fluoride treatments during a dental visit if it is the right treatment for you or your child. Professionally applied fluoride treatments are an effective way to prevent tooth decay. Discuss with your dentist whether you need fluoride treatments, and if so, how often they are advised for you.

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28. If I am drinking water with fluoride, why do I also need to brush with toothpaste that contains fluoride?

The combined use of fluoride toothpaste and fluoridated water offers protection above using either separately. Toothpaste contains a higher concentration of fluoride. Fluoride in drinking water is diluted, but it comes in contact with the teeth every time you drink tap water or beverages made from tap water, as well as foods prepared with tap water. This provides your teeth with a near constant (or continuous) exposure to fluoride all day. Use of both fluoridated water and fluoridated toothpaste is recommended because fluoride in water and fluoride in toothpaste work differently to help prevent tooth decay.

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29. If they both contain fluoride, how can they work differently?

Both drinking water and toothpaste provide important and complementary benefits. The drinking water provides long low-level protection, but the fluoride in toothpaste is at a high enough concentration that it has additional properties. Whether in water or toothpaste, fluoride works in two main ways: by slowing the activity of bacteria that cause decay, and by combining with the enamel on the surface of the teeth to make it stronger and more resistant to decay. Fluoride in the water, although at a lower concentration than in toothpaste, maintains a constant low level of fluoride in the dental plaque and saliva all day. Toothpaste provides a high level of fluoride, but only for 1-2 hours after brushing, so the water exposure during the remainder of the day takes over after that.

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30. Does toothpaste contain too much fluoride to be recommended for children?

All fluoridated toothpastes that can be purchased without a prescription are safe and effective for individuals ages 2 and older.

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31. Are there methods I can use to remove fluoride from my drinking water at home? For example, boiling or use of commercially available water filters and units?

The typical charcoal-based water filtration systems used in most homes do not remove fluoride from water. Boiling water does not remove fluoride. More costly distillation and reverse osmosis are treatment methods that have proven to be effective for removing fluoride to below 4.0 mg/L. If you choose to use home water treatment, make sure that the filter you use is certified to address your concerns. There are several

independent American National Standards Institute (ANSI) certified organizations that test and certify home water treatment units. More information about these organizations and other issues related to your water safety can be found at **http://water.epa.gov/drink/info/upload /2005_11_17_faq_fs_healthseries_filtration.pdf** (http://water.epa.gov/drink/info/upload /2005_11_17_faq_fs_healthseries_filtration.pdf) (PDF–1.2M)

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32. Is there fluoride in infant formula? Should I try to remove fluoride from infant formula?

All formulas, either concentrates or ready-to-feed, have some fluoride, but most infant formula manufacturers develop their products to ensure low levels of fluoride. A recent study by the American Dental Association (ADA) confirmed that fluoride concentrations in commercially available infant formulas are very low. It is not possible to remove this small amount of fluoride by filtering or boiling the formula; however, at normal consumption amounts, infant formula alone does not contain fluoride at levels that would be higher than the daily upper limit established by the Institute of Medicine. In liquid or powdered infant formula concentrate, the majority of fluoride comes from the water used to mix the formula. Some parents may choose to use bottled water. To learn more, check out the CDC's **Bottled Water and Fluoride** (bottled_water.htm) and FDA's Website: **http://www.fda.gov/ForConsumers/ConsumerUpdates /ucm203620.htm/** (http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm203620.htm)

(http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm203620.htm)

(http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm203620.htm) **Back to Top** (#top)

33. Is fluoride present in mouthwash and dental whitening products?

Some mouthwashes contain fluoride, and if so, are clearly labeled that way. Fluoride in mouthwashes can be another way to obtain the decay-preventing benefit of fluoride. Fluoride-containing mouth rinses are safe and effective when used as directed. Note that children under 6 should not use fluoride mouth rinses, unless directed by a dentist. Most dental whitening products do not contain fluoride and the decay preventing effectiveness of those that do is not currently known.

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34. Does bottled water contain fluoride?

Bottled water products labeled as de-ionized, purified or distilled have been treated in such a way that they contain no or only trace amounts of fluoride, unless they specifically list fluoride as an added ingredient.. Other bottled water products (such as spring water) can contain fluoride that is added or naturally present in the original source of the water. FDA sets limits for fluoride in bottled water based on several factors, including the source of the water. These limits range from 0.8 to 2.4 milligrams per liter. To learn more, check out the CDC's **Bottled Water and Fluoride** (bottled_water.htm) and FDA's Website: **http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm203620.htm** (http://www.fda.gov /ForConsumers/ConsumerUpdates/ucm203620.htm)

(http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm203620.htm)

(http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm203620.htm) **Back to Top** (#top)

One or more documents on this Web page is available in Portable Document Format (PDF). You will need **Acrobat Reader** (http://www.cdc.gov/nccdphp/shared/pdfinfo.htm) to view and print these documents.

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Page Located on the Web at http://www.cdc.gov/fluoridation/fact_sheets/cwf_qa.htm

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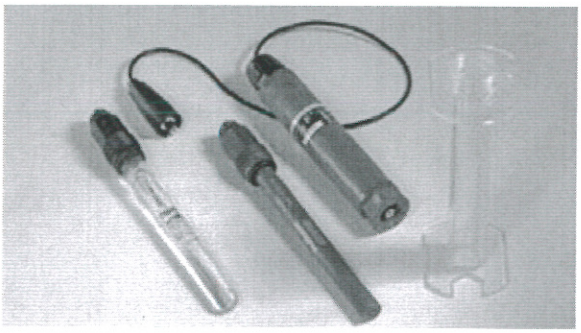
DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
SAFER • HEALTHIER • PEOPLE™

APPENDIX B

Proposed Equipment

ProMinent Fluid Controls, Inc.
136 Industry Drive, R.I.D.C. Park West
15275 Pittsburgh, PA
Tel: (412) 787 - 2484
Fax: (412) 787 - 0704



Fluoride Measurement

The Fluoride Sensor is a potentiometric sensor working with ion selective electrodes (ISE) and a reference electrode supplying the measurement signal (mV).

Basic Principles for the Measurement of Fluoride in Aqueous Solutions

Potentiometric determination of the Fluoride concentration is effected analogically to pH measurement. Instead of a glass diaphragm, a LaF3 single crystal is used. Thus, selective penetration of Fluoride Ions in the interior of the electrode is enabled. Here, the concentration-dependent potential is measured against the reference electrode as voltage and analyzed analogically to the pH measurement.

Application Areas

Typical application areas of the Fluoride Sensors are Water treament generators, where Fluoride is dosed into the drinking water for the prevention of cavities and continuous measurement is applied as means of monitoring.

Our Program offers the following Advantages:

- For easy and fast installation, Fluoride sensors are only offered as ready for operation and mounted on PE-panels, i.e. plug & play with optimally inter-adjusted components.
- Exact and reliable real-time measurement
- Long-term stable measurement
- No additional conditioning reagents (e.g. TISAB) necessary
- Easy calibration by means of ProMinent's complete Photometer-Kit (Type DT2)

URL: http://www.prominent.us/desktopdefault.aspx/tabid-2060/206_read-2905/

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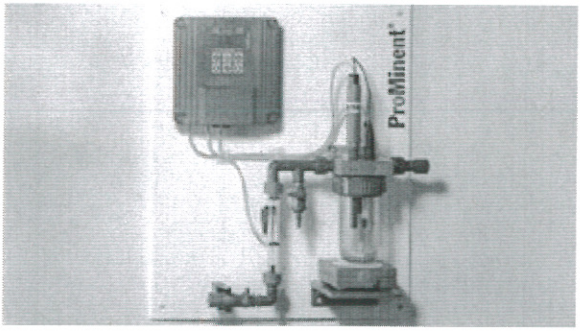

Fluoride - Pre-Assembled Measuring Station

Panel-mounted complete measuring station, that is adjusted to spezial requirements in waterworks and can quickly be installed as plug & play module.

Features

- Completely printed panel
- Completely wired
- Available for 230V AC and 115V AC

Components of the Measuring Station

Single channel controller D1C (Identity code D1CAW0F12011G000E for 230V AC or D1CAW1F12011G000E for 115V AC)

- Electrical supply 230 V 50/60 Hz or 115V 50/60 Hz
- Pause contact reserved for limit contact measuring water
- Analogue output 0/4...20mA for measurand value
- Automatic temperature compensation with temperature indication
- Alarm relay and two limit relays
- Operation languages: English (preset), German, French, Dutch

Sensors, measurement transducers and in-line probe housings

- Fluoride sensor type FLE 010 SE
- Reference electrode type REFP-SE
- Temperature sensor type Pt 100 SE for automatic temperature compensation
- Measurement transducer 4-20 mA FV1 to be directly screwed on the Fluoride sensor as well as with connection line and SN 6-plug for reference electrode
- In-line probe housing DLG IV

PVC piping with

- Rotameter with limit contact
- Gate ball valve on input side and sample ball valve
- Connections for bonded socket joint 1/2" (DN 10/d16) and hose 0.31"x0.20" (8x5 mm) are included

The measuring station can be ordered with part number 1010602 for 230V AC and with part number 1010603 for 115V AC.

URL: http://www.prominent.us/desktopdefault.aspx/tabid-2207/369_read-9044/

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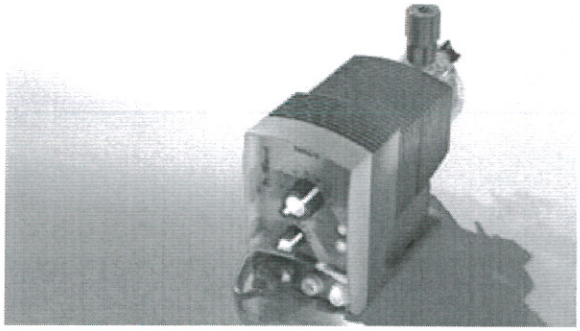


Beta® Solenoid Diaphragm Metering Pump

The solenoid metering pump Beta® is equipped with all setting and control functions for modern water treatment and chemical metering. As compared to its predecessor model, it features a pulse step down and step up function. This facilitates a more accurate adaptation to external signal transducers. The result is an easier and more precise adjustment of the metering to the actual requirements. Thanks to the use of new technologies, the energy consumption could be reduced by approx. 50 %. The Beta® can be easily re-adjusted during operation.

Advantages

- Pulse-controlled step up and step down for optimal adaptation to existing signal transducers
- For each chemical a matching liquid end
- Thus universal use possible
- Drive with almost no wear
- Excellent permanent operation properties
- Optimal price/performance ratio
- Energy saving of 50 % thanks to higher efficiency
- Adjustable, integrated pulse step up and step down
- Optional: Relay module, quick and easy to refit

Application focuses
Metering of chemicals and disinfectants:

- Drinking water and swimming pool water treatment
- Chemical applications
- Process engineering
- Cooling water circuits

Features

- Capacity range 0.74-32 l/h, 25-2 bar
- Continuous stroke length adjustment from 0-100 % (recomm
- Supplied in PP, Acrylic, PVDF, PTFE, stainless steel
- Patented deaeration for PP, Acrylic and PVDF
- Self-deaerating dosing head type in PP and Acrylic
- HV liquid end for highly viscous media
- Power supply 100 - 230 V as standard
- 10-setting stroke frequency adjustment from 10-100 %
- External control via volt-free contacts with impulse for spee
- Connector for 2-stage level switch
- 3 LED display for operation, warning and fault indication

Pump type Beta	bar	l/h	Strokes/min.	Suction lift mWS	Connector dimensions outer Ø × inner Ø mm
BT4b 1000 *	10	0.74	180	6 ***	6 × 4
BT4b 1601 *	16	1.1	180	6 ***	6 × 4
BT4b 1602 *	16	2.2	180	6 ***	6 × 4
BT4b 1604 *	16	3.8	180	6 ***	6 × 4

BT4b 0708 *	7	7.1	180	6 ***	8 × 5
BT4b 0413	4	12.3	180	3 ***	8 × 5
BT4b 0220	2	19.0	180	2 ***	12 × 9
BT5b 2504	25	2.9	180	6 ***	8 × 4 **
BT5b 1008	10	6.8	180	6 ***	8 × 5
BT5b 0713	7	11.0	180	4 ***	8 × 5
BT5b 0420	4	17.1	180	3 ***	12 × 9
BT5b 0232	2	32.0	180	2 ***	12 × 9

* Reduced pressure 4, 7 and 10 bar pump types are available for specialised applications, e.g. for use in swimming pool systems. Further information on request.
** 6 mm inner diameter in stainless steel version.
*** Suction lift readings when liquid end and suction tubing are full, or for self-degassing liquid end when the suction tubing contains air.

Beta Dosing pumps with self-ventilating dosing heads

Pump type Beta	bar	l/h	Strokes/min.	Suction lift mWS	Connector dimensions outer Ø × inner Ø mm
BT4b 1601	16	0,59	180	1,8 ***	6 × 4
BT4b 1602	16	1,4	180	2,1 ***	6 × 4
BT4b 1604	10	2,9	180	2,7 ***	6 × 4
BT4b 0708	7	6,6	180	2,0 ***	8 × 5
BT4b 0413	4	10,8	180	2,0 ***	8 × 5
BT4b 0220	2	16,2	180	2,0 ***	12 × 9
BT5b 1008	10	6,3	180	3,0	8 × 5
BT5b 0713	7	10,5	180	2,5	8 × 5
BT5b 0420	4	15,6	180	2,5	12 × 9

*** Suction lift readings when liquid end and suction tubing are full, or for self-degassing liquid end when the suction tubing contains air.

Materials in contact with medium

	Dosing head	Suction/pressure connection	Seals	Balls
PPE	Polypropylene	Polypropylene	EPDM	Ceramic
PPB	Polypropylene	Polypropylene	FPM	Ceramic
PPT	Polypropylene	PVDF	PTFE	Ceramic
NPE	Acrylic	PVC	EPDM	Ceramic
NPB	Acrylic	PVC	FPM	Ceramic
NPT	Acrylic	PVDF	PTFE	Ceramic
PVT	PVDF	PVDF	PTFE	Ceramic
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic
SST	Stainless steel no 1.4404	Stainless steel no 1.4404	PTFE	Ceramic

Dosing diaphram with PTFE-coating.
FPM = Fluorine Rubber

Brochure

Brochure - Low-pressure dosing pumps up to 1,000 l/h [3.16 MB]

Safety Declaration Form

Declaration of Decontamination [0.1 MB]

Exploded Views of Liquid Ends and Spare Parts

Exploded view - spare parts - Beta b Solenoid Diaphragm Metering Pumps [2.71 MB]

Flyer

Flyer - Solenoid Metering Pump Beta®/ 4b and Beta®/ 5b [0.11 MB]

Operating Instruction

Supplementary Instructions - Beta/ 4, Beta/ 5 version a, extra-low voltage version [0.05 MB]

Supplementary Instructions - Beta/ 4, Beta/ 5 version b, extra-low voltage version [0.43 MB]

Operating Manual - Beta ® b BT4b and BT5b Solenoid Metering Pump [1.52 MB]

General Operating Instructions - ProMinent® Solenoid Metering Pumps [1.14 MB]

Supplementary Instructions - ProMinent® Solenoid-Driven Metering Pumps [0.14 MB]

Relay retrofitting for Beta® b + delta® [0.51 MB]

other

Dimensional drawing - Beta b Solenoid Diaphragm Metering Pumps [1.21 MB]

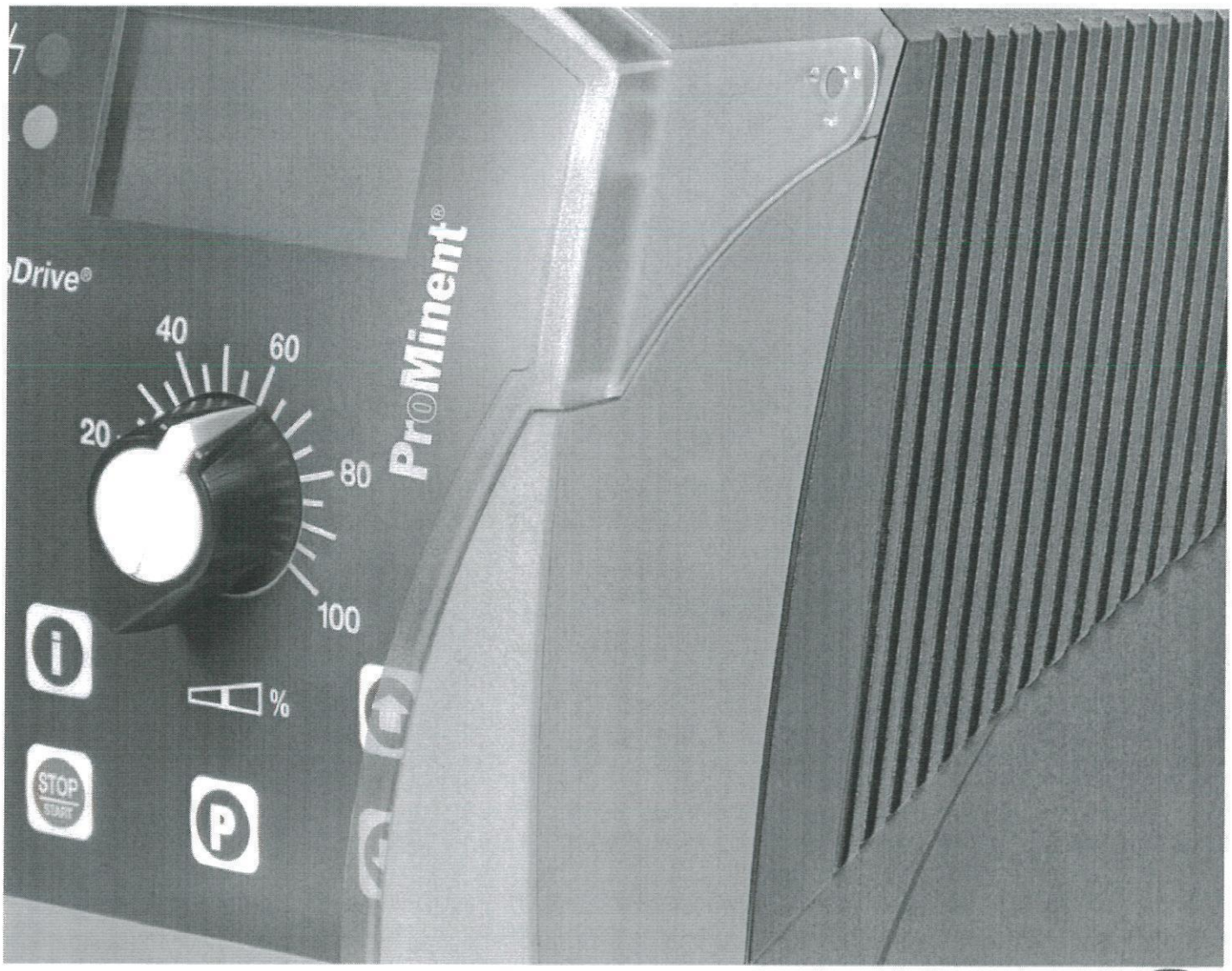
Performance diagram - Beta b Solenoid Diaphragm Metering Pumps [0.21 MB]

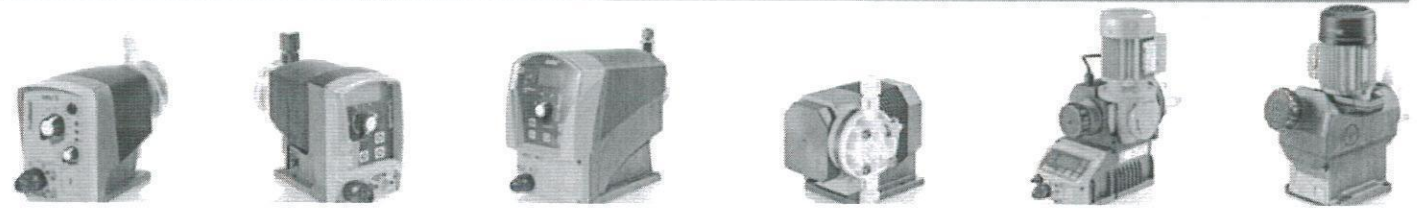
URL: http://www.prominent.us/desktopdefault.aspx/tabid-9804/1029_read-179/

ProMinent®

Safe, precise and cost-effective dosing

Low-pressure metering pumps up to 1,000 l/h





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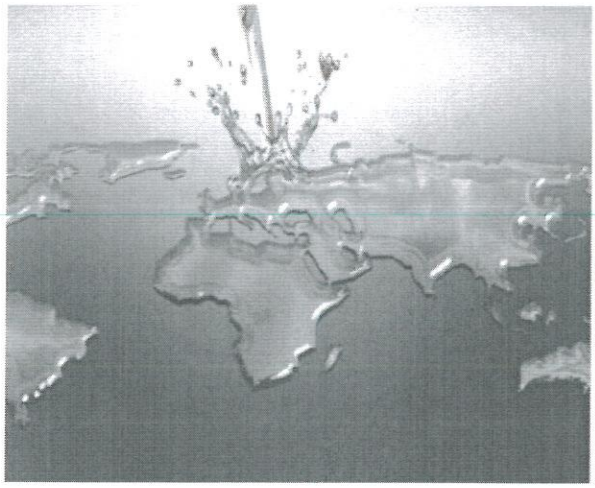
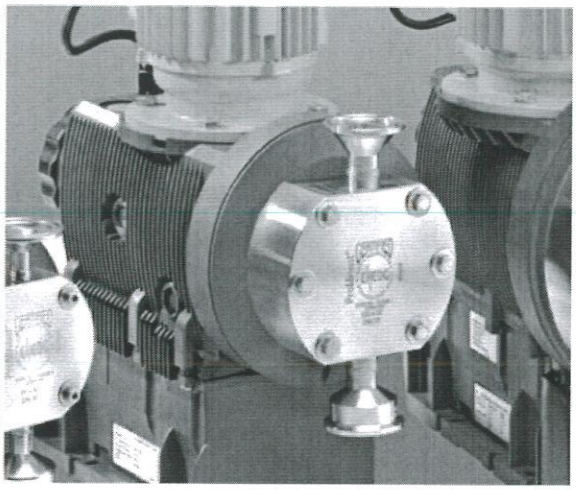


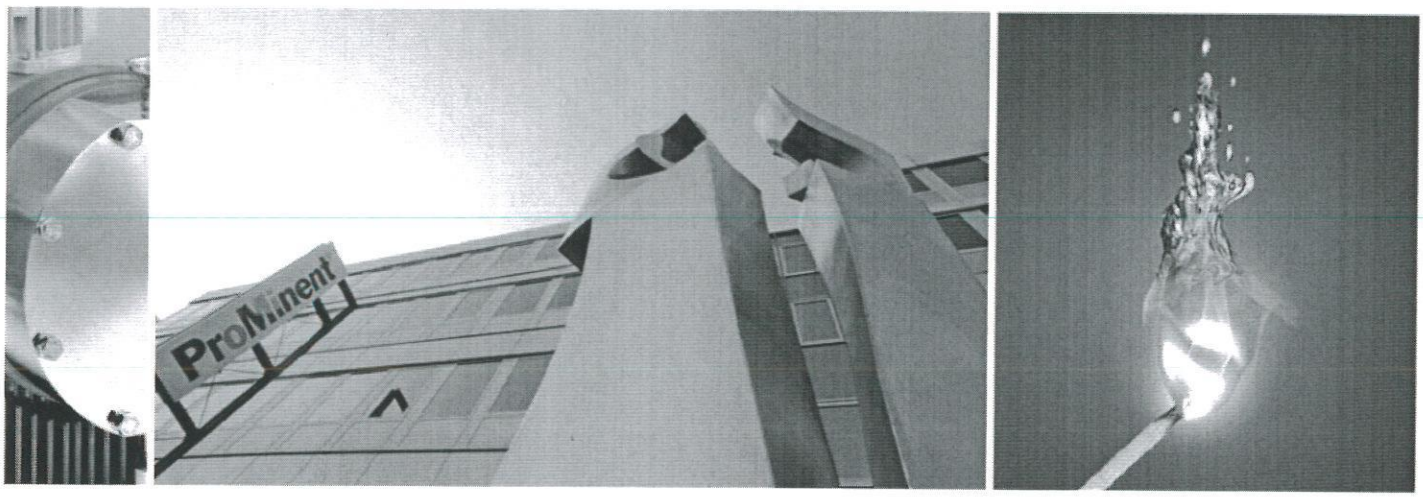


Low-pressure metering pumps up to 1,000 l/h

Thanks to the company's extensive range (liquid ends, models, capacity, setting and control options), ProMinent® low-pressure pumps can complete almost every dosing process in a sustainable, environmentally-friendly and energy-saving manner.

Give us a call and discover the many opportunities for using ProMinent® low-pressure pumps.

ProMinent



Our largest range of products – well-dosed and infinitely reliable

ProMinent is undoubtedly known to you as a manufacturer of solenoid metering pumps? That is in effect how we originated and we are now the world-leader in this product sector. However over the 50 years since our company was founded, we have significantly extended our product range for our customers. Why? Because we recognise that our customers rightly do not expect us to supply a product but rather a solution to a problem.

Every sector works differently and has its own unique requirements. We have adapted to meet these requirements.

Expertise alone is not enough. Our customers are essential for the success story of ProMinent. Their trust and the intensive exchange of ideas relating to their requirements and needs is what has made our success possible.

Global market leadership brings obligations, such as the need for close exchanges with customers. This dialogue shows that the trend is moving towards more energy-efficient and environmentally-friendly technologies. ProMinent is reacting to this with many new developments, such as energy-saving products. This means that the future will bring many more innovations in the field of chemical metering and water treatment developed in Heidelberg. We all have but a single goal: to exceed our customers expectations as far as possible.

Solenoid-driven diaphragm metering pumps

Low-wear pumps for small capacities

Function

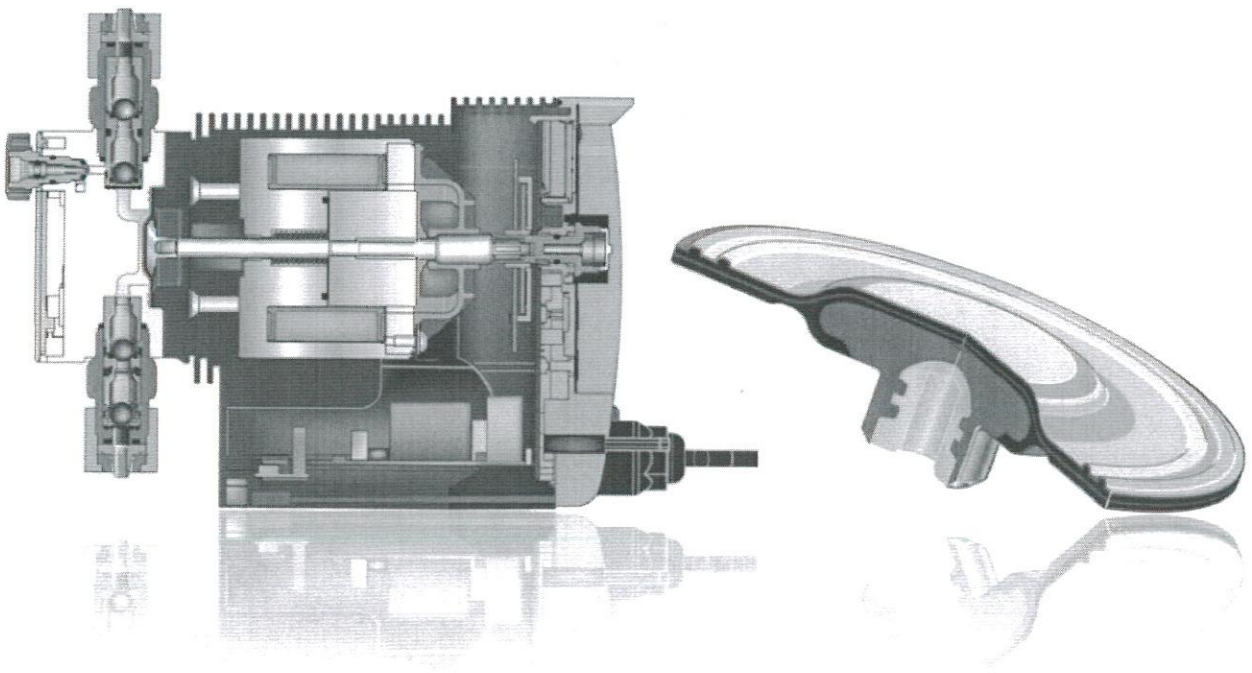
The solenoid armature is moved to and from by switching the solenoid on and off. This stroke movement is transmitted to the diaphragm in the liquid end. Two non-return valves prevent backflow of the feed chemical during the pumping process. The dosing capacity of a solenoid diaphragm metering pump can be adjusted via the stroke length and the stroke frequency.

Features

- Capacity range: 1 to 75 l/h at 25 to 2 bar back pressure
- Virtually wear-free drive with only one moving part
- Pump requires no bearing or shaft lubrication
- Outstanding continuous running properties
- Attractive technical alternative in the small capacity
- Range up to 32 l/h and 2 bar
- Maximum protection against overload
- Low energy consumption thanks to high efficiency
- Fully-sealed housing offers IP 65 protection

Applications

- General: chemical dosing in laboratories and in industry, with capacity up to 75 l/h
- Potable water and swimming pool water treatment: dosing of chemicals for disinfection and pH adjustment
- Cooling water circuits: dosing of disinfectants
- Mini-plant technology
- Paper industry, defoamers
- Electroplating and surface treatment
- Pool additives, slide grinding systems



Motor-driven diaphragm metering pumps

High dosing precision and robust technology

Function

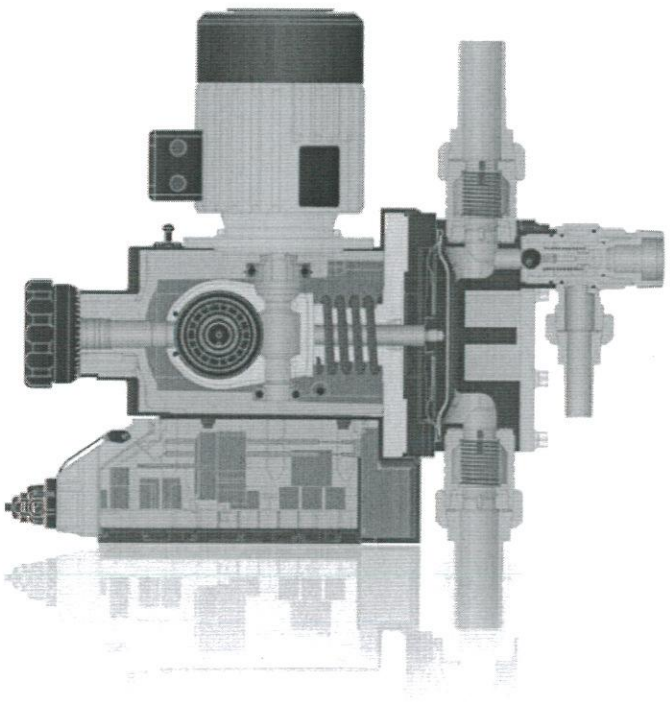
The rotation of an electric motor is transferred through a worm gear and converted to a stroke movement via an eccentric cam. The link rod transmits this stroke movement to the diaphragm in the liquid end. Two non-return valves prevent backflow of the feed chemicals during the pumping process. The capacity of a motor-driven diaphragm metering pump can be adjusted via the stroke frequency – in this case the motor speed – and the stroke length.

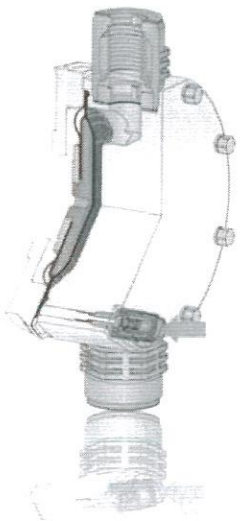
Features

- Extremely wide capacity range
- High dosing precision even with fluctuating pressure conditions (characteristic curve has flat response to changing pressure) ensures savings on chemicals and precise process control
- Robust, attractively priced drive in the higher capacity range
- Simple integration and retrofit in automated processes through flexible control via stroke length and motor speed regulation
- Maximum safety through double diaphragm system and integral overload protection

Applications

- General:
  chemical dosing up to over 1,000 l/h
- Potable water treatment:
  dosing of disinfectants
- Cooling water circuits:
  dosing of disinfectants
- Wastewater treatment:
  dosing of flocculants
- Paper industry:
  dosing of additives
- Plastics manufacturing:
  dosing of additives





Wide range for reliability and precision

Motor-driven diaphragm metering pumps

alpha c
Robust and simple to use
Capacity range
1.0 – 30.6 l/h
10 – 2 bar

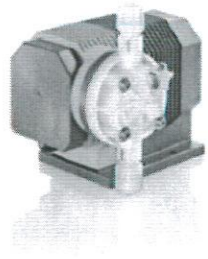
Vario C
Precise and reliable
Capacity range
8 – 75 l/h
10 – 4 bar

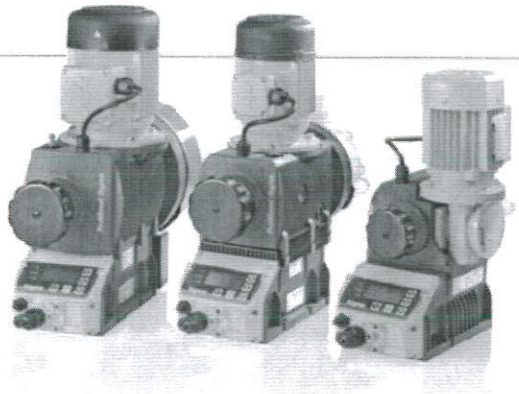
Sigma
Safety is standard

Sigma/ 1
Capacity range
17 – 144 l/h
12 – 4 bar

Sigma/ 2
Capacity range
50 – 420 l/h
16 – 4 bar

Sigma/ 3
Capacity range
145 – 1,030 l/h
12 – 4 bar





Solenoid-driven diaphragm metering pumps/Precisions piston metering pumps

Beta® b
The all-rounder

Capacity range
0.74 – 32 l/h
25 – 2 bar

gamma/ L
Diverse applications

Capacity range
0.74 – 32 l/h
16 – 2 bar

delta®
Perfect dosing output
Capacity range
7.5 – 75 l/h
25 – 2 bar

mikro delta®
The specialist for ultra-small quantities
Capacity range
150 – 1,500 ml/h
60 – 20 bar

Metering pumps

Pneumados
Ultra-simple handling
Capacity range
0.76 – 16.7 l/h
16 – 2 bar

Peristaltic pumps

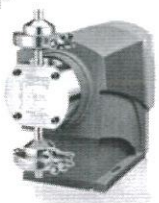
DULCO®flex
Precise and reproducible

DF2a
Capacity range 0.4 / 0.8 / 1.6 / 2.4 l/h
up to 1.5 bar
DF3a
Capacity range 0.4 / 0.8 / 1.6 / 2.4 l/h
up to 1.5 bar
DF4a
Capacity range 0.4 / 1.5 / 6.0 / 12.0 l/h
up to 4 bar

Hygienic pumps

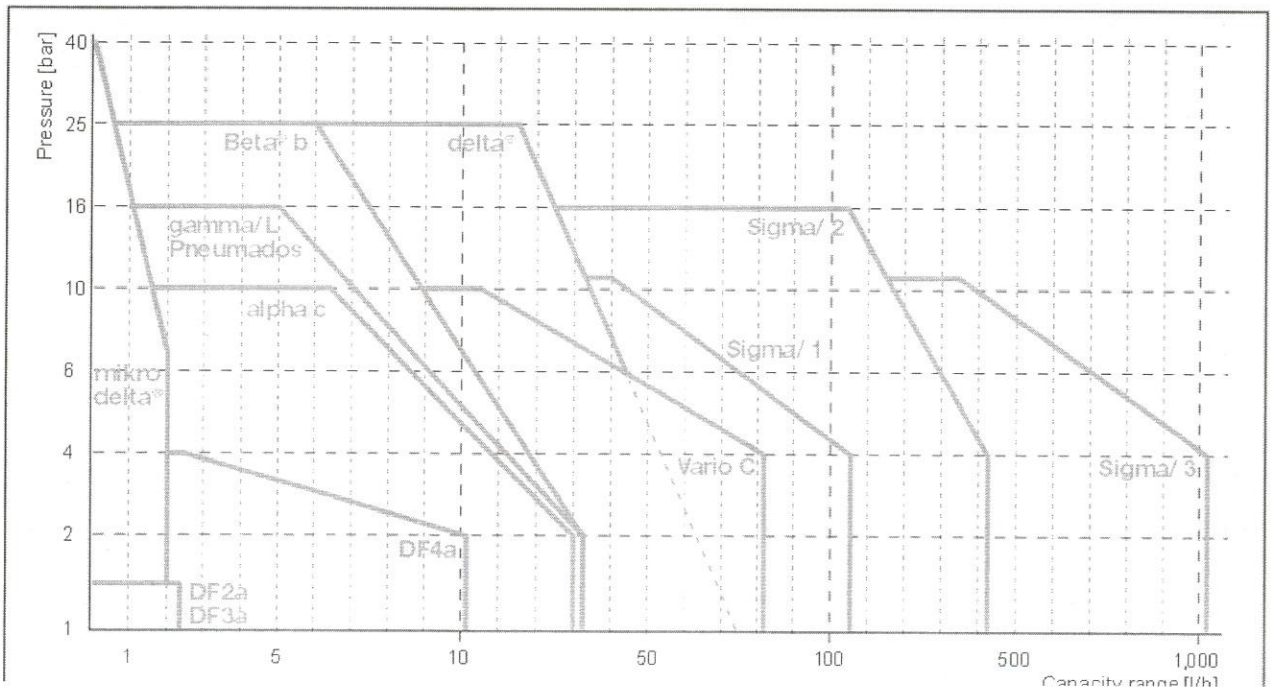
Hygienic pumps with stainless steel pump heads (to comply with the requirements for EHEDG).

delta®



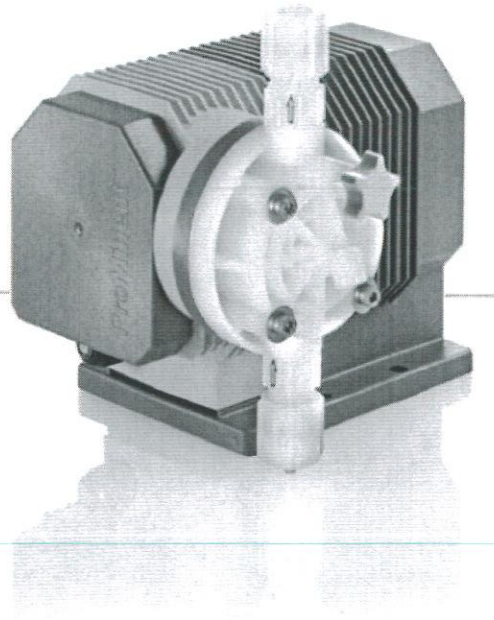
Sigma

Capacity overview of metering pumps



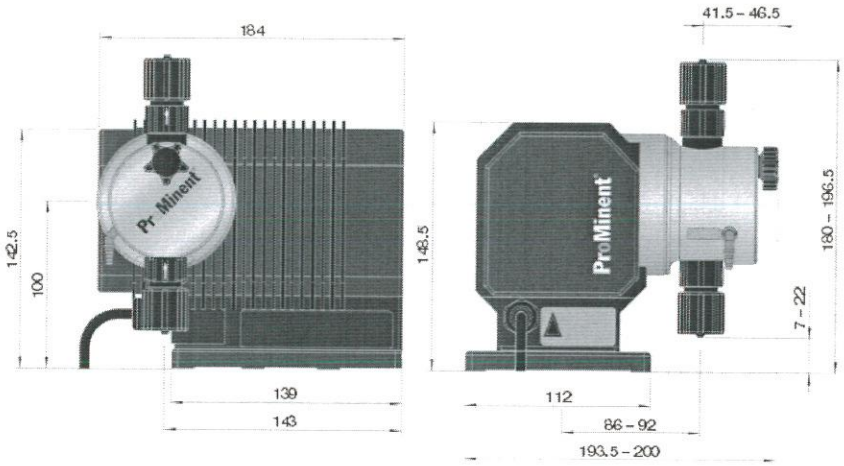
alpha c

Motor-driven **diaphragm metering pump**



The economical solution for simple applications in the small capacity range.

- Capacity range 1.0–30.6 l/h, 10–2 bar
- Good suction capacity, smooth dosing stroke and constant, precise dosing
- Safe operation even with effervescent media through patented venting system
- Suitable for many applications through two gear ratios, four sizes of liquid end and two material versions (PVDF, Acrylic glass/PVC)
- Capacity range can be adjusted via the stroke length in 10 % steps
- Control via mains supply ON/OFF



alpha c

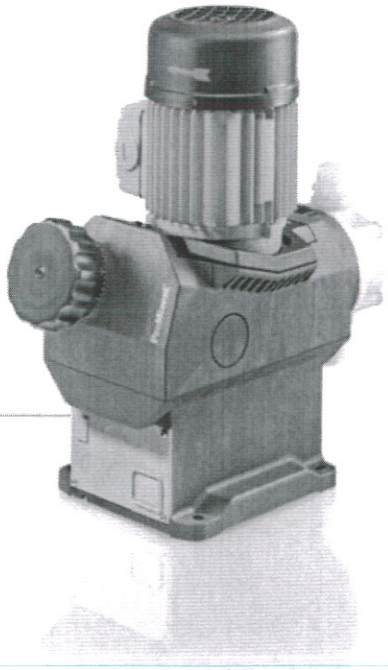
Pump type	Delivery rate at 50 Hz bar	l/h	ml/stroke	Nr. of strokes strokes/min	Stroke length mm	Suction head mWC	Connection size o Ø x i Ø mm
ALPc 1001	10.0	1.0	0.29	58	2	5.1	6x4
ALPc 1002	10.0	1.8	0.52	58	2	5.1	6x4
ALPc 1004	10.0	3.5	1.01	58	3	5.1	8x5
ALPc 1008	7.0	7.7	1.00	128	3	5.1	8x5
ALPc 0707	7.0	6.9	1.98	58	3	4.1	8x5
ALPc 0417	4.0	17.0	2.51	128	3	4.1	8x5
ALPc 0230	2.0	30.6	3.98	128	3	3.1	12x9

With 60 Hz design approx. 20 % increasing delivery rate

Materials in contact with medium

Material	Liquid end	Suction/pressure port	Seals	Valve balls
PPE	Polypropylene	Polypropylene	EPDM	Ceramic
PPB	Polypropylene	Polypropylene	FPM	Ceramic
NPE	Acrylic glass	PVC	EPDM	Ceramic
NPB	Acrylic glass	PVC	FPM	Ceramic
PVT	PVDF	PVDF	PTFE	Ceramic

DEVELOPAN® metering diaphragm with PTFE coating for all types.
FPM: fluorine rubber.

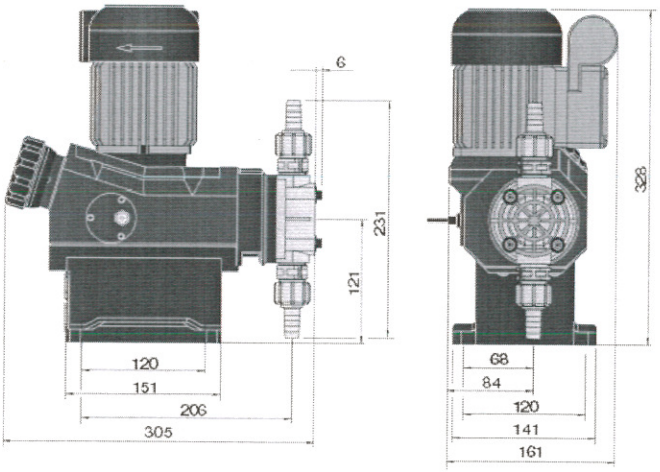


Vario C

Motor-driven **diaphragm metering pump**

The pump for simple applications.

- Capacity range
  8–75 l/h, 10–4 bar
- Good suction capacity, smooth dosing stroke and constant, precise dosing
- High process quality through dosing reproducibility of better than ±2 %
- Robust construction with powerful motor and glass fibre reinforced housing
- Suitable for many applications through four gear ratios, two sizes of liquid end and two material versions



Vario C

	With motor 1,500 rpm at 50 Hz Delivery rate at max. backpressure			Stroke rate	Suction head	Perm. asmiss. pressure suction side	Connection suction/pressure side
Pump type	bar	l/h	ml/stroke	strokes/min	mWC	bar	G-DN
10008	10	8	3.6	38	7	2.8	3/4 – 10
10016	10	16	3.6	77	7	2.8	3/4 – 10
07026	7	26	3.6	120	7	2.8	3/4 – 10
07042	7	42	3.6	192	7	2.8	3/4 – 10
07012	7	12	5.4	38	6	1.7	3/4 – 10
07024	7	24	5.4	77	6	1.7	3/4 – 10
04039	4	40	5.4	120	6	1.7	3/4 – 10
04063	4	64	5.4	192	6	1.7	3/4 – 10

With 60 Hz design approx. 20 % increasing delivery rate

Materials in contact with medium

Material	Liquid end	Suction/pressure port	Seals	Valve balls	Valve seat
PVT*	PVDF	PVDF	PTFE	Ceramic	PTFE
PPE	PP	PP	EPDM	Ceramic	PP
PCB	PVC	PVC	FPM	Ceramic	PVC
SST	Stainless steel Mat. Nr. 1.4404	Stainless steel Mat. Nr. 1.4404	PTFE	Stainless steel W.Nr. 1.4404	

DEVELOPAN® metering diaphragm with PTFE coating for all types.

*on request

Sigma

Motor-driven **diaphragm metering pump**

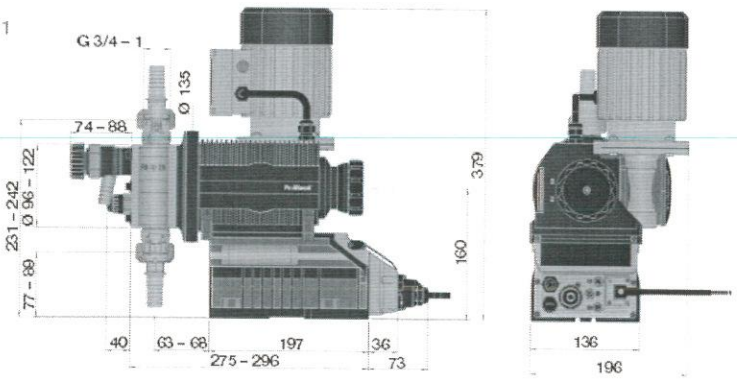
The right capacity for every requirement. Each Sigma pump is available as a basic version or as a microprocessor/control version with internal electronics.

The three variants differ in their capacity ranges:

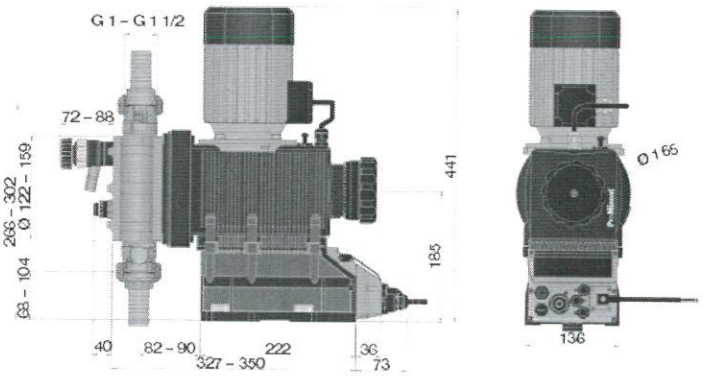
Sigma/ 1 17 – 144 l/h, 12 – 4 bar
Sigma/ 2 50 – 420 l/h, 16 – 4 bar
Sigma/ 3 145 – 1.030 l/h, 12 – 4 bar

- Process safety through double diaphragm with diaphragm rupture indication
- Ventilation option provides functional reliability
- Integral relief valve protects against overload
- Simple operation through large plain text display (microprocessor version)
- Ideal for simplified spares management when a number of pumps in the Sigma series are used together. Their key features are:
- Straightforward linking to bus-networked systems via PROFIBUS DP® or CAN-open interface (microprocessor version)
- For volume-proportional, measured value-dependent, time and pulse-controlled dosing

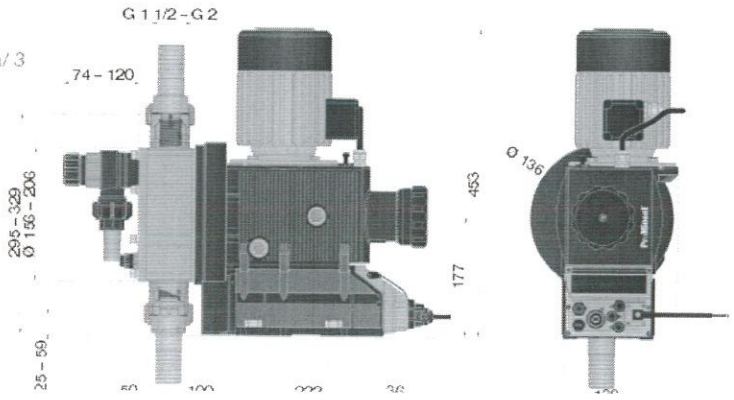
Sigma/ 1

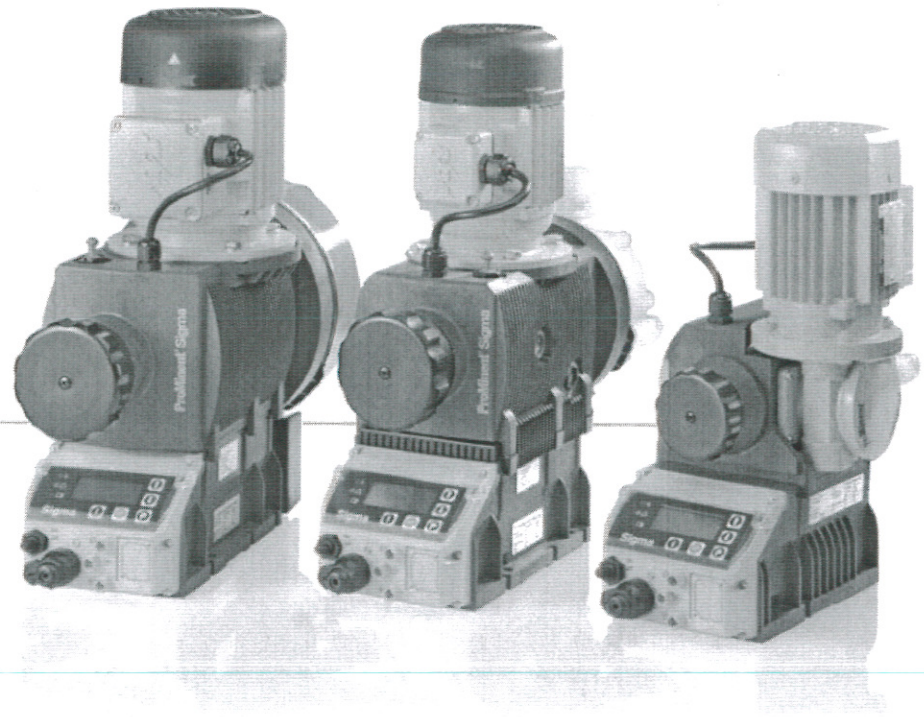


Sigma/ 2



Sigma/ 3





Sigma

Pump type	With motor 1,500 rpm at 50 Hz Delivery rate at max. backpressure bar	l/h	ml/stroke	strokes/min	Suction head mWC	Perm. admiss. pressure suction side bar	Connection suction/pressure side G-DN
Sigma/ 1							
12017	12	17	4.0	73	7	1	¾–10
12035	12	35	4.0	143	7	1	¾–10
10050	10	50	4.0	200	7	1	¾–10
10022	10	22	5.1	73	6	1	¾–10
10044	10	44	5.1	143	6	1	¾–10
07065	7	65	5.1	200	6	1	¾–10
07042	7	42	9.7	73	3	1	1–15
04084	4	84	9.7	143	3	1	1–15
04120	4	120	9.7	200	3	1	1–15
Sigma/ 2							
16050	16	48	11.4	73	7	3	1–15
16090	16	86	11.4	132	7	3	1–15
16130	16	125	10.9	198	7	3	1–15
07120	7	120	27.4	73	5	1	1½–25
07220	7	220	27.7	132	5	1	1½–25
04350	4	350	29.4	198	5	1	1½–25
Sigma/ 3							
120145	12	145	31.5	72	2	5	1½–25
120190	12	190	31.5	103	2	5	1½–25
120270	12	270	31.5	144	2	5	1½–25
120330	12	330	31.5	180	2	5	1½–25
070410	7	410	95.1	72	1	4	2–32
070590	7	590	95.1	103	1	4	2–32
040830	4	830	95.1	144	1	3	2–32
041030	4	1,030	95.1	180	1	3	2–32

Sigma Control version and basic version operating with 60 Hz increases delivery rate approx. 20 %.
Sigma/ 2 and Sigma/ 3 with PVDF design max. 10 bar.

Materials in contact with medium

Material	Liquid end	Suction/pressure port	Seals/Ball seat	Valve balls	Integrated overflow valve
Sigma/ 1 + Sigma/ 2					
PVT	PVDF	PVDF	PTFE/PTFE	Ceramic	PVDF/FPM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE/PTFE	Stainless steel 1.4404	Stainless steel/FPM or EPDM

Sigma/ 3

		DN 25 ball valve			DN 32 ball valve			
Material	Suction/pressure port liquid end	Seals	Valve balls	Valve seat	Seals	Valve plate/ valve spring	Valve seat	Integrated overflow valve
PVT	PVDF	PTFE	Glas	PTFE	PTFE	Ceramic/Hast C. + CTFE	PTFE	PVDF/FPM or EPDM
SST	Stainless steel 1.4581	PTFE	Stainless steel 1.4404	PTFE	PTFE	Stainless steel 1.4404/Hast C.	PTFE	Stainless steel/FPM or EPDM

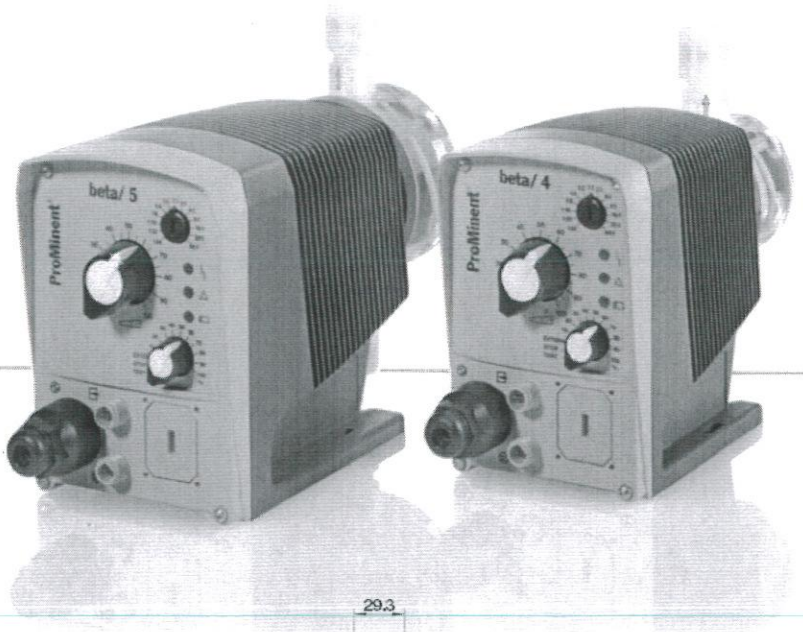
DEVELOPAN® metering diaphragm with PTFE coating for all types.

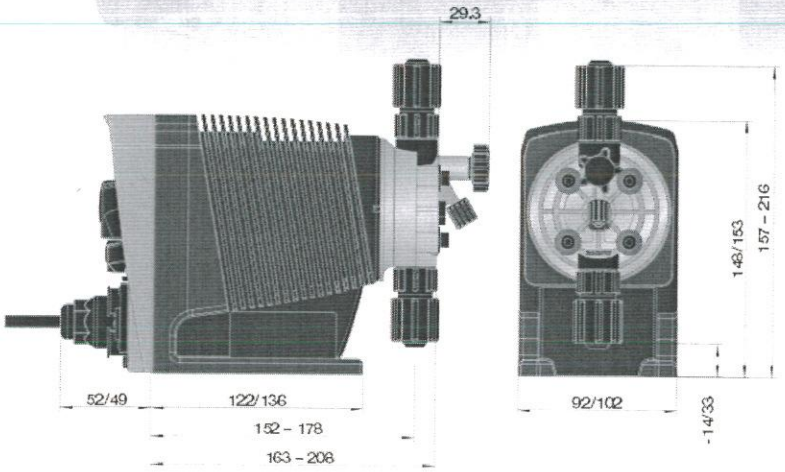
Beta® b

Solenoid-driven **diaphragm metering pump**

The first choice for modern water treatment and chemical dosing.

- Capacity range 0.74 – 32 l/h, 25 – 2 bar
- Improved efficiency generates up to 50 % energy savings
- Adjustable integral pulse step-up and step-down for optimum adaptation to existing signal generators
- Liquid ends to suit every chemical guarantee their universal use
- Virtually wear-free drive
- Excellent continuous run properties
- Optional: relay module – fast and simple to retrofit
- Input for level switch





Beta® b

Pump type	Delivery rate at max. backpressure bar	l/h	ml/stroke	Nr. of strokes strokes/min	Connection size o Ø x i Ø mm	Suction head mWC	Average power consumption W
BT4b 1000	10	0.74	0.07	180	6 x 4	6.0	7.2
BT4b 1601	16	1.10	0.10	180	6 x 4	6.0	9.6
BT4b 1602	16	2.20	0.20	180	6 x 4	6.0	11.2
BT4b 1604	16	3.60	0.33	180	6 x 4	6.0	15.2
BT4b 0708	7	7.10	0.66	180	8 x 5	6.0	15.2
BT4b 0413	4	12.30	1.14	180	8 x 5	3.0	15.2
BT4b 0220	2	19.00	1.76	180	12 x 9	2.0	15.2
BT5b 2504	25	2.90	0.27	180	8 x 4 [1]	6.0	19.2
BT5b 1008	10	6.80	0.63	180	8 x 5	6.0	19.2
BT5b 0713	7	11.00	1.02	180	8 x 5	4.0	19.2
BT5b 0420	4	17.10	1.58	180	12 x 9	3.0	19.2
BT5b 0232	2	32.00	2.96	180	12 x 9	2.0	19.2

Beta® b metering pumps are also available with self-degassing liquid ends and for highly viscous media.

Reduced pressure 4, 7 and 10 bar pump types are available for specialised applications, e. g. for use in swimming pool systems.

Suction lift readings when liquid end and suction tubing are full, or for self-degassing liquid end when the suction tubing contains air.

1) 6 mm inner diameter in stainless steel version.

Materials in contact with medium

Material	Liquid end	Suction/pressure port	Seals	Valve balls
PPT	Polypropylene	PVDF	PTFE	Ceramic
NPT	Acrylic glass	PVDF	PTFE	Ceramic
PVT	PVDF	PVDF	PTFE	Ceramic
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic
SST	Stainless steel Mat. Nr. 1.4404	Stainless steel Mat. Nr. 1.4404	PTFE	Ceramic

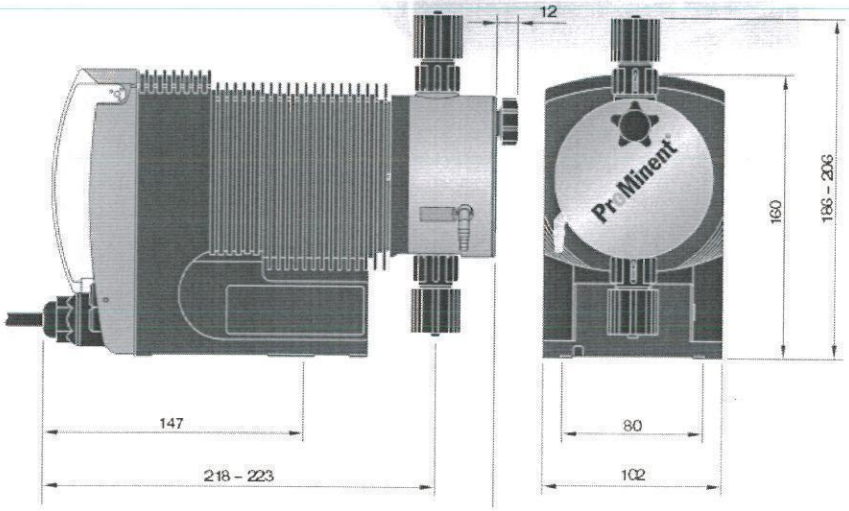
DEVELOPAN® metering diaphragm with PTFE coating for all types.

gamma/ L

Solenoid-driven **diaphragm metering pump**

A calibratable pump for the most exacting output requirements, universally controllable, with BUS interface.

- Capacity range 0.74 – 32 l/h, 16 – 2 bar
- Direct adjustment and monitoring of the dosing capacity on a plain text display help prevent incorrect dosing
- Cost and space savings through integral 2-week process timer
- Clearly readable figures thanks to large illuminated LC display
- Simple and straightforward connection to complex process control systems thanks to optional configuration with PROFIBUS® DP interface
- Input for level switch



gamma/ L

Pump type	Delivery rate at max. backpressure bar	l/h	ml/stroke	Nr. of strokes strokes/min	Connection size o Ø x i Ø mm	Suction head mWC	Average power consumption W
GALa 1000	10	0.74	0.07	190	6 x 4	6.0	17
GALa 1601	16	1.10	0.10	190	6 x 4	6.0	17
GALa 1602	16	2.10	0.19	190	6 x 4	6.0	17
GALa 1005	10	4.40	0.41	190	8 x 5 [1]	6.0	17
GALa 0708	7	7.10	0.66	190	8 x 5	6.0	17
GALa 0413	4	12.30	1.14	190	8 x 5	3.0	17
GALa 0220	2	19.00	1.76	190	12 x 9	2.0	17
GALa 1605	16	4.10	0.38	180	8 x 5 [1]	6.0	23
GALa 1008	10	6.90	0.63	190	8 x 5	6.0	23
GALa 0713	7	11.00	1.02	190	8 x 5	4.0	23
GALa 0420	4	17.10	1.58	190	12 x 9	3.0	23
GALa 0232	2	32.00	2.96	190	12 x 9	2.0	23

gamma/ L metering pumps are also available with self-degassing liquid end and for highly viscous media.

Suction lift readings when liquid end and suction tubing are full, or for self-degassing liquid end when the suction tubing contains air.

1) 5 mm inner diameter in stainless steel version.

Materials in contact with medium

Material	Liquid end	Suction/pressure port	Seals	Valve balls
PPT	Polypropylene	PVDF	PTFE	Ceramic
NPT	Acrylic glass	PVDF	PTFE	Ceramic
PVT	PVDF	PVDF	PTFE	Ceramic
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic
SST	Stainless steel Mat. Nr. 1.4404	Stainless steel Mat. Nr. 1.4404	PTFE	Ceramic

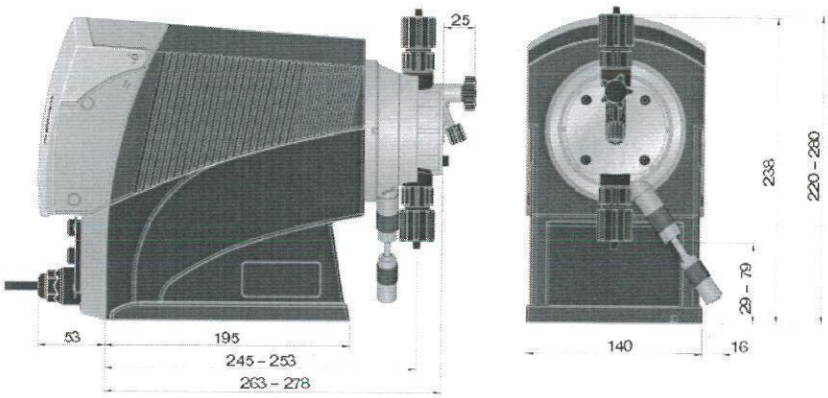
DEVELOPAN® metering diaphragm with PTFE coating for all types.

delta®

Solenoid-driven **diaphragm metering pump**

High-end technology for the most exacting requirements and varied applications. The world's first metering pump with regulated solenoid drive (optoDrive®).

- Capacity range 7.5–75 l/h, 25–2 bar
- Excellent efficiency as no need for accessories, such as pulsation dampers, flow gauges etc.
- Flexible adaptation to the dosing task with excellent precision
- The integral injection point monitoring unit detects hydraulic fault states that can be reported via the optional relays
- Versatile control options for use with almost every application
- Option to connect via PROFIBUS® or CANbus to the central control station
- Suitable for use as a central control unit with the "Process Timer" option, making programmable logic controls (PLC) redundant



delta®

Pump type	Pressure bar	max. delivery rate l/h	stroke volume ml/stroke	Nr. of strokes strokes/min	max. connection size o Ø x i Ø mm	Suction head mWC
DLTA 2508	25	7.5	0.62	200	8x4[1]	5
DLTA 1608	16	7.8	0.65	200	8x5[1]	5
DLTA 1612	16	11.3	0.94	200	8x5	6
DLTA 1020	10	19.1	1.59	200	12x9	5
DLTA 0730	7	29.2	2.43	200	12x9	5
DLTA 0450	4	49.0	4.08	200	G¾–DN10	3
DLTA 0280	2	75.0	6.25	200	G¾–DN10	2

Suction height with primed liquid end and primed suction line.

1) 6 mm inner diameter in stainless steel version.

Materials in contact with medium

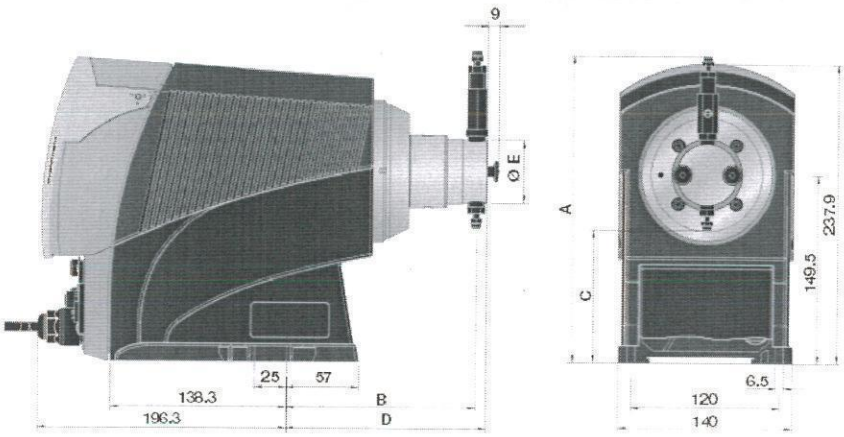
Material	Liquid end	Suction/pressure port	Seals	Valve balls
NPE	Acrylic glass	PVC	EPDM	Ceramic
NPB	Acrylic glass	PVC	FPM	Ceramic
PVT	PVDF	PVDF	PTFE	Ceramic
SST	Stainless steel Mat. Nr. 1.4404	Stainless steel Mat. Nr. 1.4404	PTFE	Ceramic

mikro delta®

Precision piston metering pump

Continuous, highly accurate and safe dosing of ultra-small volumes – no problem for the latest generation of pump.

- Capacity range 150–1,500 ml/h, 60–20 bar
- Stroke volume of 1–250 µl
- Available in PTFE and stainless steel
- Large illuminated graphic display
- Optional external control via contacts, mA, PROFIBUS® or CANopen (optional)
- Continuous or pulsing operation
- Precisely controlled dosing process by means of regulated solenoid drive



mikro delta®

Pump type	Delivery rate with max. backpressure bar	ml/h	µl/stroke	Plunger Ø mm	Connection size hose mm	Connection size piping mm	Suction head mWC	Backpressure valve holding pressure bar
Version TT								
100150 TT	10	145	24.17	2.5	1.75x1.15	1.59	6	2.5
100600 TT	10	580	96.67	5	1.75x1.15	1.59	6	2.5
101500 TT	10	1490	246.67	8	3.20x2.40	3.18	4	1.5
Version SS								
600150 SS	60	145	24.17	2.5	1.75x1.15	1.90	6	2.5
400600 SS	40	580	96.67	5	1.75x1.15	1.90	6	2.5
201500 SS	20	1490	246.67	8	3.20x2.40	3.18	4	1.5

Suction height with primed liquid end and primed suction line.

Materials in contact with medium

Pump type	Liquid type	Suction/pressure port	Valve balls	Valve seats	Plunger	Valve seal	Plunger seal
TTT	PTFE + Carbon	PTFE + Carbon	Ruby	Ceramic	Ceramic	PTFE	PTFE, white
TTG	PTFE + Carbon	PTFE + Carbon	Ruby	Ceramic	Ceramic	PTFE	PTFE + graphite
SST	Stainless steel 1.4571	Stainless steel 1.4571	Ruby	Ceramic	Ceramic	PTFE	PTFE, white
SSG	Stainless steel 1.4571	Stainless steel 1.4571	Ruby	Ceramic	Ceramic	PTFE	PTFE + graphite

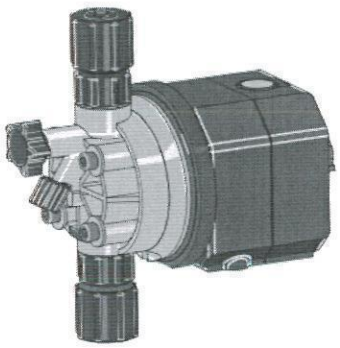
Pneumados

Pneumatically operated diaphragm metering pump

Pneumatically operated diaphragm metering pump. The standard solution for simple dosing tasks wherever there is no electrical power available.

- Capacity range
  0.76–16.7 l/h, 16–2 bar
- Continuous stroke length adjustment
- Available in PTFE and stainless steel
- Stroke rate of up to 180 strokes/min

Typical applications
- Car washes
- Animal feed handling
- Bottle disinfection in filling plants



Pneumados

Pump type	Delivery rate with max. backpressure bar	l/h	ml/stroke	Nr. of strokes strokes/min	Connection size o Ø x i Ø mm	Section head mWC
PNDb 1000	10	0.76	0.07	180	6 x 4	6.0
PNDb 1601	16	1.00	0.09	180	6 x 4	6.0
PNDb 1602	16	1.70	0.16	180	6 x 4	6.0
PNDb 1005	10	3.80	0.35	180	8 x 5 [1]	5.0
PNDb 0709	7	6.30	0.58	180	8 x 5	4.0
PNDb 0413	4	10.50	0.97	180	8 x 5	3.0
PNDb 0220	2	16.70	1.55	180	12 x 9	2.0

1) 6 x 4 mm in stainless steel version.

Materials in contact with medium

	Liquid end	Suction/pressure port	Seals	Valve balls
PVT	PVDF	PVDF	PTFE	Ceramic
SST	Stainless steel Mat. Nr. 1.4404	Stainless steel Mat. Nr 1.4404	PTFE	Ceramic

DULCO®flex

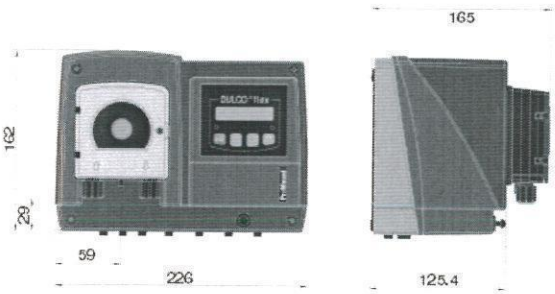
Peristaltic **pumps**

The best solutions are the simplest. The ideal pump series for typical applications in swimming pools, whirlpools and in spa zones.

DF2a for private pools
DF3a for the dosing of fragrances in saunas
DF4a for private and public pools and for general dosing of chemicals

- Capacity range 0.4 – 12 l/h, 4 – 1.5 bar
- Virtually silent operation
- Simple and safe to operate
- More efficient operation by using "Saver" mode
- Service-friendly design
- Spring-mounted rollers for constant rolling pressure and improved service life of the hose

DULCO®flex DF4a



DULCO®flex						
Pump type	Delivery rate bar	l/h	Frequenzy rpm	Connection size o Ø x i Ø mm	Suction head mWC	Intake head mWC
DULCO®flex DF2a						
0204	1.5	0.4	5	6x4/10x4	4	3
0208	1.5	0.8	10	6x4/10x4	4	3
0216	1.5	1.6	20	6x4/10x4	4	3
0224	1.5	2.4	30	6x4	4	2
DULCO®flex DF3a						
0204	1.5	0.4	5	6x4	4	2
0208	1.5	0.8	10	6x4	4	2
0216	1.5	1.6	20	6x4	4	2
0224	1.5	2.4	30	6x4	4	2
DULCO®flex DF4a						
04004	4.0	0.4	0–85	6x4/10x4	4	3
04015	4.0	1.5	0–85	6x4/10x4	4	3
03060	2.5	6.0	0–85	6x4/10x4	4	3
02120	2.0	12.0	0–85	6x4/10x4	4	3

Hygienic pumps

The EHEDG-certified specialists

These hygienic pumps are fitted with stainless steel liquid ends (to comply with the requirements for EHEDG hygienic design and construction).

Motor-driven or solenoid driven can be used depending on the output required.

Applications
- Dosing of aromas and colourings
- Dosing of additives directly upstream of the filling process
- Dosing of enzyme solutions
- Application of sauces and oils to finished products

Features
- EGEDG-certified liquid end
- Spring-mounted and seal-free suction discharge valve
- Internal surface roughness < 0.8 µm
- CIP-compatible, excellent microbiological safety
- Simple to fit and dismantle thanks to tri-clamp connections

delta®

Diaphragm metering pump delta® with regulated optoDrive® solenoid drive. Output data dependent on pump type.

- Flow rate of up to 70 l/h
- Back pressure of up to max. 7 bar

Sigma

Motor-driven pump series Sigma, output data dependent on pump type.

- Flow rate of up to 1,000 l/h
- Back pressure of up to max. 5 bar

Service

Global service locally

We already offer our service to you even if you are not yet our customer.

Our pre-sales services ensure that you get the optimum solution for your individual needs:

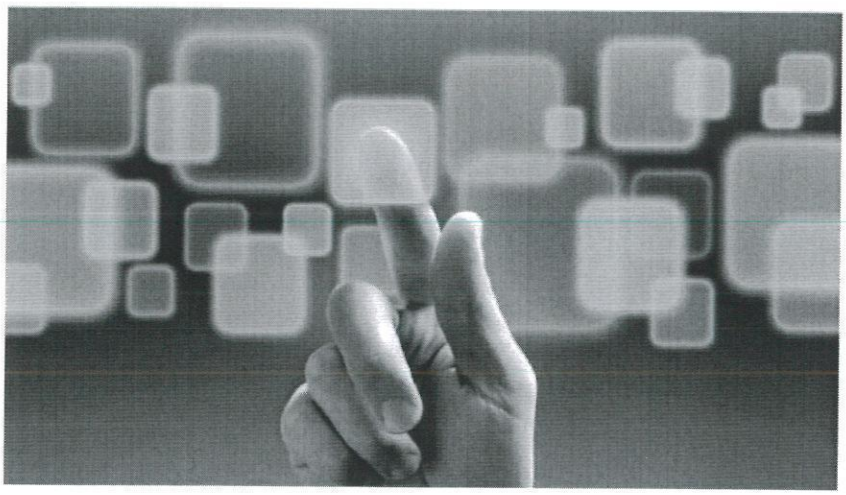
- Advice in choosing the products
- Application and process optimisation
- Project planning

However, our commitment does not end with delivery. We offer you a comprehensive after-sales service, which lasts for the entire service life of your equipment. That maximises your productivity and minimises your operating costs:

- Assembly/installation
- Commissioning
- Maintenance
- Spare parts service
- Repair
- Troubleshooting

Thanks to our worldwide presence in over 100 countries, our service is available wherever you need it.

Worldwide contact



Experts in Chem-Feed and Water Treatment

ProMinent is at home in more than 100 countries of the world. This guarantees worldwide availability of the products and short distances to the customer. We offer you the same high quality standard in products and services worldwide. For you at your location: experience and knowhow in water treatment and chemical fluid handling are available worldwide.

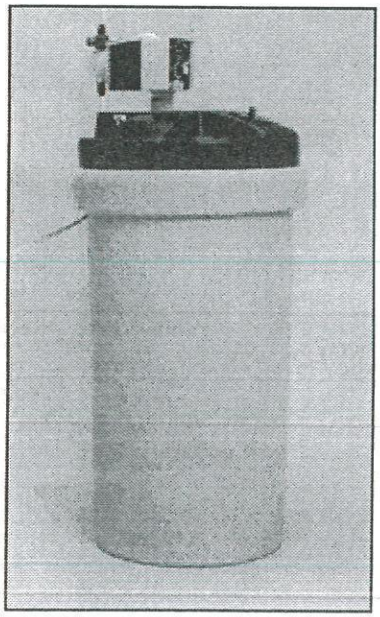
ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5–11
69123 Heidelberg
Germany

Telephone: +49 6221 842-0
Telefax: +49 6221 842-617

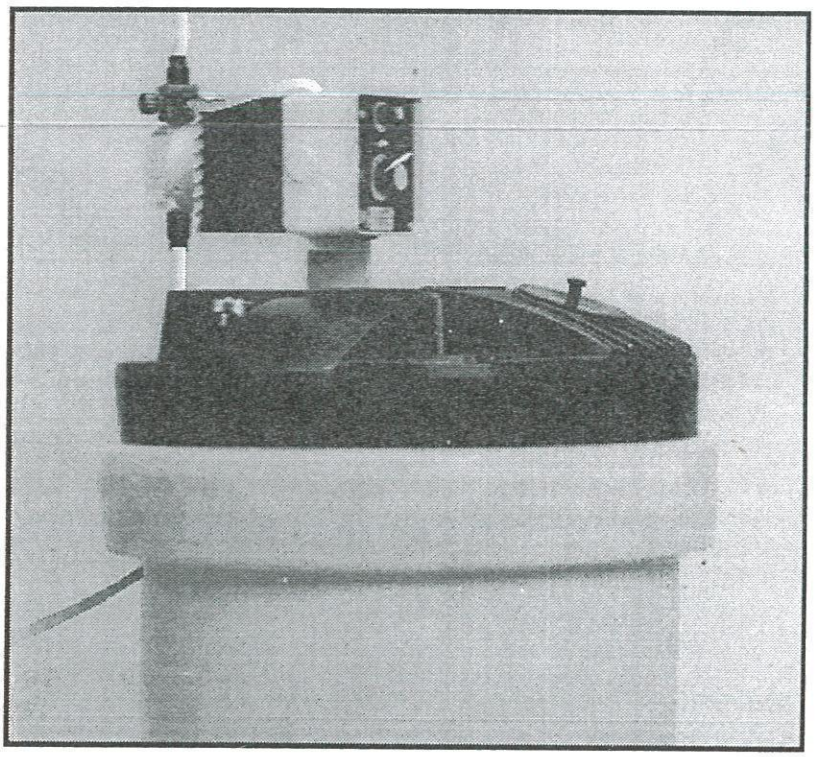
info@prominent.com

Information**Sheet**

Fluoride Saturator
Model No. 28850



- *Up-Flow Design*
- *Low Maintenance*
- *Continuous Duty*
- *Integrated Cover Assembly*
- *Fluoridate Water Flows to 10,000 GPM*



LMI
LIQUID METRONICS DIVISION
MILTON ROY
A unit of Sundstrand Corporation

8 Post Office Square
Acton, MA 01720 USA
TEL: (978) 263-9800
FAX: (978) 264-9172
http://www.lmipumps.com

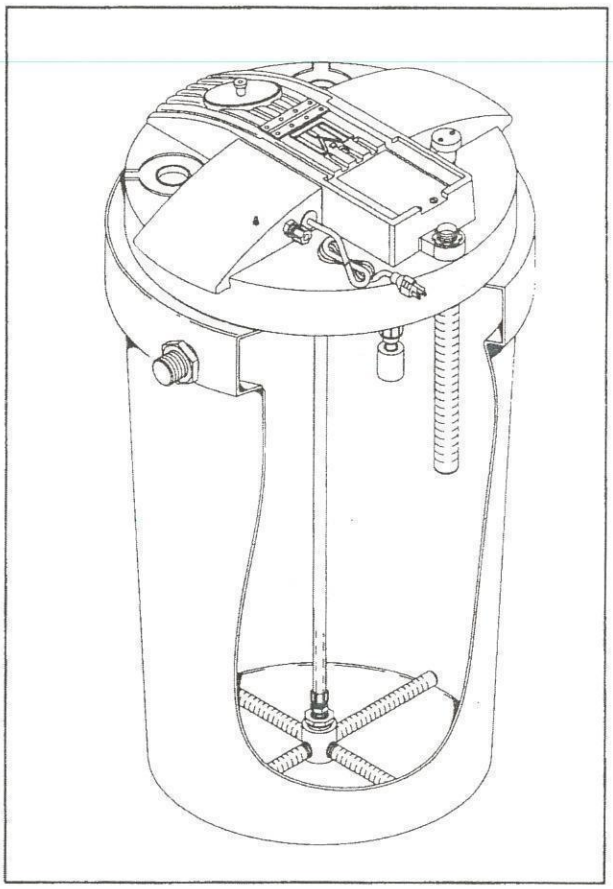
NQA ISO9001

Replaces same of Rev. C 5/97
1076. C 3/98

Instruction **Sheet**

Fluoride Saturator
Model No. 28850

- *Automatic Solution Level Control – Continuous Duty*
- *Up-Flow Design – Minimal Maintenance*
- *Molded Polyethylene Cover – Component Protection*
- *Compact – Economical – Easily Installed*
- *For Sodium Fluoride*



Component Parts

Tank Cover

- Tank cover with hinged fill hatch cover, pump mounting recess on molded polyethylene cover.
- Water inlet for .375" OD polyethylene 10 ft (3 m) tubing included
- Syphon breaker
- Solenoid valve - Flow control, 115 VAC
- Liquid level switch, 12 VAC
- Suction tube strainer, PVC
- Six (6) foot power cord

Distributor Tube Assembly

- Flexible vinyl tubing connector, from water inlet control to distributor
- Rigid PVC anti-rise pipe
- Distributor tubes, rigid PVC

Tank Assembly

- Fifty (50) gallon tank, yellow polyethylene
- 3/4" NPT female connection

Operation

Design Simplicity

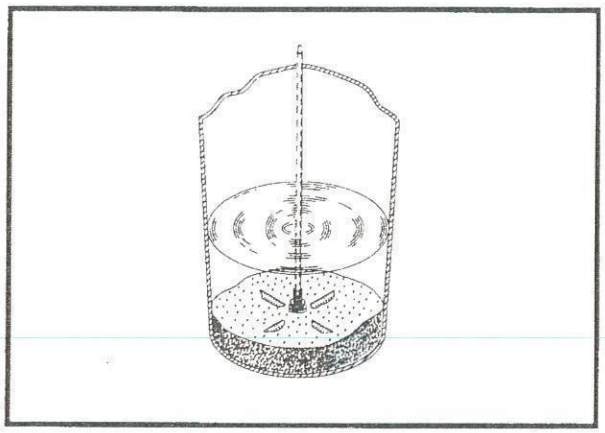
The LMI sodium fluoride saturator provides an easily maintained source of saturated sodium fluoride solution; the unit is designed for efficiency economy, ease of installation and minimal maintenance. The complete saturator assembly includes cover, distributor tube assembly and tank.

Integrated Cover Assembly

The cover consists of a tank cover which houses the saturator components, including solenoid valve, syphon breaker, and liquid level switch. In addition, the cover also provides a suction tube strainer, recess for pump mounting and a hinged fill hatch cover. Push button light switch allows for visual inspection of fluoride bed level.

Up-Flow Saturation

The integrally mounted liquid level switch controls solenoid valve operation to maintain a proper solution level in the tank. The distributor tube assembly supplies fresh water to a bed of sodium fluoride at tank bottom. Water, dispersed by the distributor tubes 'flows up' through and dissolves the powder/crystals of sodium fluoride to provide a saturated (4%) solution.



Metering Pump

LMI chemical metering pumps can be conveniently mounted in the recess provided on the saturator cover assembly. Pumps with liquid handling assembly materials of Hypalon, PVC and acrylic are generally recommended for pumping sodium fluoride solution.

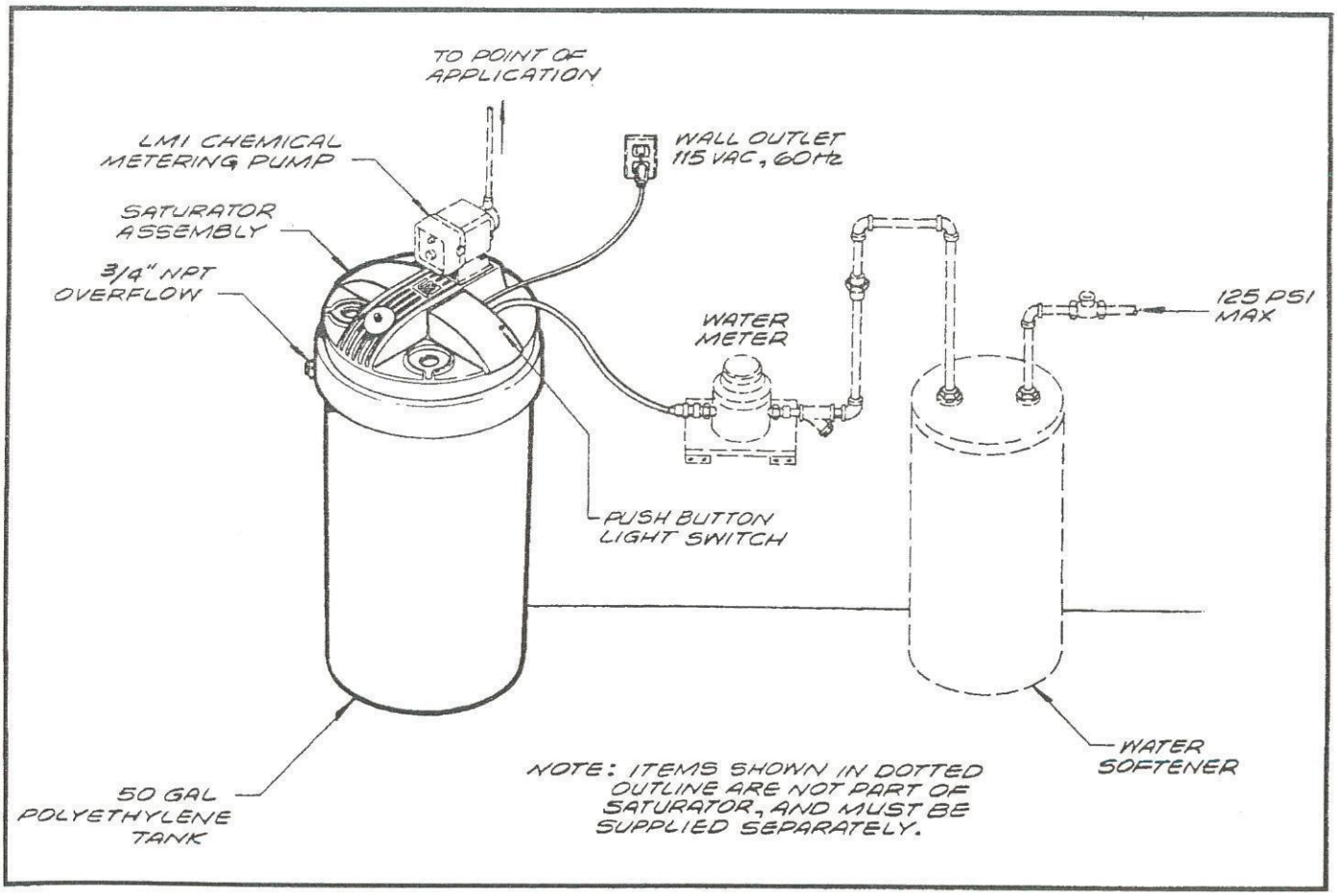
Series A1, A9, B7, B9, C7 and C9 pumps can be used for addition of sodium fluoride solution with constant water flow rate applications.

Series A7, B7 and C7 pumps can be used with applications requiring automatic output control either with an LMI RFP flowmeter for flow proportional treatment or with an LMI Liquitron current to frequency converter for instrument responsive proportional treatment.

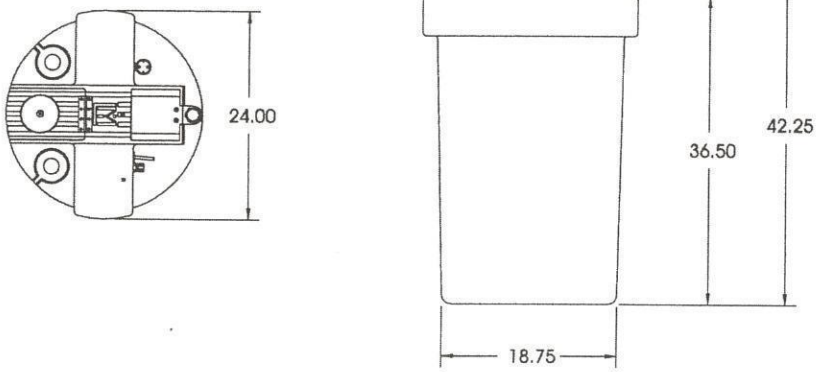
Solution Tank

The fifty (50) gallon tank is UV light resistant, yellow polyethylene, with tapered sides, five (5) gallon graduate marking, and is complete with overflow connection installed.

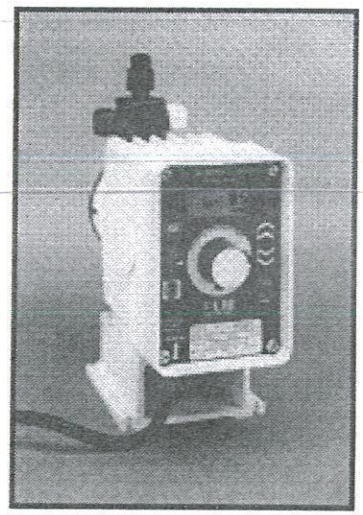
Typical Installation



Dimensions

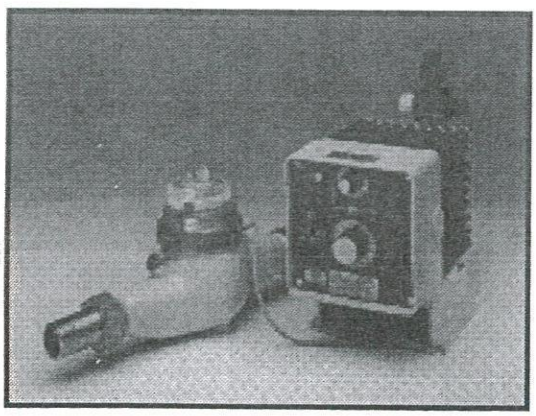


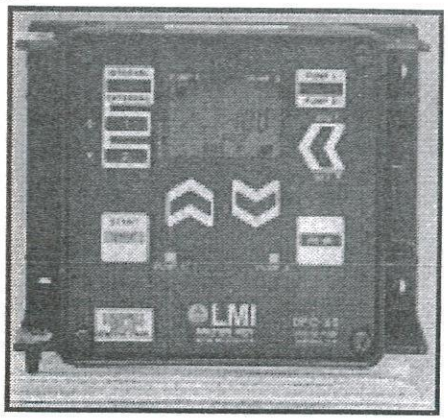
Shipping Dimensions:	24 x 24 x 47 in (609 x 609 x 1192 mm)
Shipping Weight:	37 lbs (16.8 kg)
Power Requirements:	During fill cycle only, 115 VAC, 60 Hz, 25 watts



For Instrument Responsive Proportional Feed

For Automatic Flow Proportional Feed





APPENDIX C

Conceptual Cost Opinions – Fluoride Upgrades

Project Name: Wilton Water System
Project# : 13.3194
Date: 5/20/2013
Prepared By: R. Flores

C.T. MALE ASSOCIATES

Conceptual Cost Opinion Fluoride Upgrades								
ID	Description	Quantity	Units	Materials	Labor	Equipment	Total Unit Cost	Subtotals
1	Mulbery							
a	Removal of Existing Cl Tank	1	LS		$120.00		$120.00	
b	New Cl Double Wall Tank	1	LS	$1,200.00	$120.00		$1,320.00	
c	Re-set Chlorine Transfer Pump	1	LS		$180.00		$180.00	
d	Water Softener	1	LS	$900.00	$400.00		$1,300.00	
e	Water Meter	1	LS	$200.00	$180.00		$380.00	
f	Back Flow Preventer	1	LS	$40.00	$120.00		$160.00	
g	Saturator	1	LS	$500.00	$120.00		$620.00	
h	Fluoride Feed Pump	1	LS	$1,300.00	$180.00		$1,480.00	
i	Injection Quill	1	LS	$250.00	$240.00		$490.00	
j	Fluoride Probe	1	LS	$800.00	$120.00		$920.00	
k	Fluoride Sensor	1	LS	$1,200.00	$180.00		$1,380.00	
l	Eye Wash	1	LS	$350.00	$60.00		$410.00	
m	SCADA Connection/Screens	1	LS	$1,000.00	$2,000.00		$3,000.00	
n	Misc. Piping	1	LS				$5,000.00	
o	Misc. Electric	1	LS				$1,000.00	
								$18,000.00
2	Jones Road							
a	Removal of Existing Cl Tank	1	LS		$120.00		$120.00	
b	New Cl Double Wall Tank	1	LS	$1,200.00	$120.00		$1,320.00	
c	Re-set Chlorine Transfer Pump	1	LS		$180.00		$180.00	
d	Water Softener	1	LS	$900.00	$400.00		$1,300.00	
e	Water Meter	1	LS	$200.00	$180.00		$380.00	
f	Back Flow Preventer	1	LS	$40.00	$120.00		$160.00	
g	Saturator	1	LS	$500.00	$120.00		$620.00	
h	Fluoride Feed Pump	1	LS	$1,300.00	$180.00		$1,480.00	
i	Injection Quill	1	LS	$250.00	$240.00		$490.00	
j	Fluoride Probe	1	LS	$800.00	$120.00		$920.00	
k	Fluoride Sensor	1	LS	$1,200.00	$180.00		$1,380.00	
l	Eye Wash	1	LS	$350.00	$60.00		$410.00	
m	SCADA Connection/Screens	1	LS	$1,000.00	$2,000.00		$3,000.00	
n	Misc. Piping	1	LS				$5,000.00	
o	Misc. Electric	1	LS				$1,000.00	
								$18,000.00
3	Fairways							
a	Water Softener	1	LS	$900.00	$400.00		$1,300.00	
b	Water Meter	1	LS	$200.00	$180.00		$380.00	
c	Back Flow Preventer	1	LS	$40.00	$120.00		$160.00	
d	Saturator	1	LS	$500.00	$120.00		$620.00	
e	Fluoride Feed Pump	1	LS	$1,300.00	$180.00		$1,480.00	
f	Injection Quill	1	LS	$250.00	$240.00		$490.00	
g	Fluoride Probe	1	LS	$800.00	$120.00		$920.00	
h	Fluoride Sensor	1	LS	$1,200.00	$180.00		$1,380.00	
i	Eye Wash	1	LS	$350.00	$60.00		$410.00	
j	SCADA Connection/Screens	1	LS	$1,000.00	$2,000.00		$3,000.00	
k	Misc. Piping	1	LS				$5,000.00	
l	Misc. Electric	1	LS				$1,000.00	
								$16,000.00
4	County Connection							
a	Eye Wash	1	LS	$350.00	$60.00		$410.00	
b	Water Meter	1	LS	$200.00	$180.00		$380.00	
c	Saturator	1	LS	$500.00	$60.00		$560.00	
d	Fluoride Feed Pump	1	LS	$1,300.00	$180.00		$1,480.00	
e	Injection Quill	1	LS	$250.00	$240.00		$490.00	
f	Fluoride Probe	1	LS	$800.00	$120.00		$920.00	
g	Fluoride Sensor	1	LS	$1,200.00	$180.00		$1,380.00	
h	SCADA Connection/Screens	1	LS	$1,000.00	$2,000.00		$3,000.00	
i	Misc. Piping	1	LS				$5,000.00	
j	Misc. Electric	1	LS				$1,000.00	
								$15,000.00
5	Division One Costs							
a	Mob/Demob	1	LS				$3,350.00	
b	Insurance and Bonds	1	LS				$1,340.00	
c	General Conditions	1	LS				$6,700.00	
d	Overhead and Profit	1	LS				$10,050.00	
								$21,000.00

Subtotal	$88,000.00
Contingency at 20%	$18,000.00
Engineering	$20,000.00
Total	$126,000.00