Water Treatment Products Limited Equipment - Dosage Pumps

PULSAtron and PULSAtron Plus

This document is designed to explain the principles of operation of Pulsafeeder Dosing pumps.

In addition there is guidance on how to select the correct pump for your application and what other considerations are necessary to ensure the final equipment installation delivers both the amount of chemical and the control required.

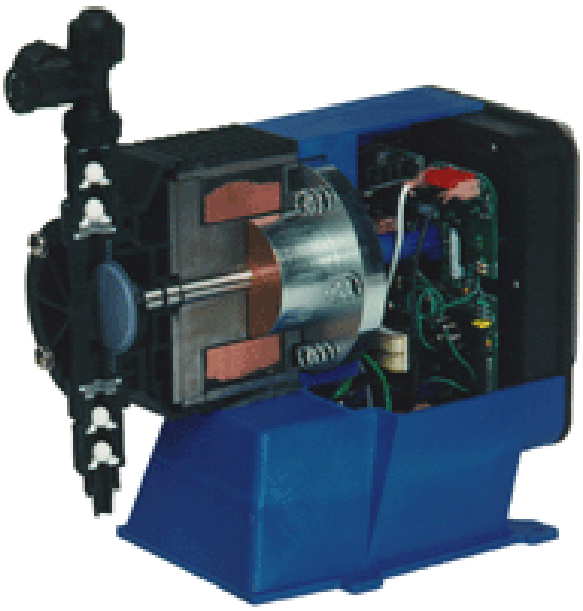
The standard range of pumps stocked and offered are from the PULSAtron and PULSAtron Plus ranges.

The vast majority of water treatment applications can be satisfied from this exceptional range of equipment.

In the unlikely event that these ranges do not meet your requirements, or you have to replace or refurbish an existing pump from another range or manufacturer, please do not hesitate to contact us for further details.

PULSAtron Metering Pumps

All PULSAtron metering pumps operate by magnetic impulse actuation. An electrical impulse generates one stroke of the pump via a magnet situated in the pump housing as illustrated in the photograph.



The forward motion of the stroke pushes against a diaphragm in the pump head (often referred to as the “wet end”) and discharges chemical in the pump head to the treated water system.

The forward motion of the stroke breaks the electrical circuit and a return spring pushes the push rod back to its original position.

This return motion creates suction in the wet end and draws chemical into the now empty wet end diaphragm chamber.

In this way, with impulse being continually applied in rapid succession, liquid is pumped.

The amount of liquid – or chemical - chemical being displaced can be varied and controlled in two ways within the pump itself.

i. By varying the stroke of the pump. This varies the amount of chemical drawn up and discharged on each stroke sequence as it varies the capacity of the diaphragm chamber.

ii. By varying the stroke rate. All **PULSAtron** and **PULSAtron Plus** Pumps are capable of operating from 0 to 125 strokes per minute or 0 to 7500 strokes per hour. Obviously the lower the stroke rate and/or length, the smaller the volume of chemical that will be discharged on each stroke. The combination of varying stroke length and stroke rate gives rise to a pump’s “Turn Down” ratio.

Turn Down Ratio

Turn Down Ratio describes the flexibility of a particular pump in terms of the variation in output it can achieve.

Stroke Rate and Stroke length can both be varied - in practice – from 10 to 100%. If you go below 10% pump accuracy tends to become non linear and hence less accurate.

The variation by a factor of 10 in both Stroke Length and Stroke Rate gives rise to a Turn Down Ratio of 10 x 10 = 100.

Thus a Turn Down Ratio of 100 means that the pump is capable of dosing down to 1/100th of its maximum output.

Therefore a pump rated at 5 litres/hour will obviously be suitable to dose 5 litres/hour, but –

it will also be able to accurately dose down to 5/100 litres/hour, .05 litres/hour or 50 ml/hour.

This is an important consideration because it means that any PULSAtron pump can cover a wide range of outputs.

This is why we don't always stock the complete range of outputs as individual pumps are so flexible.

Depending on the model of pump being utilised, impulses will be generated in one of three ways;

1. **Internally by the pump itself.**

   To vary the rate of dosage the pump normally has the ability to vary the rate of impulses generated. This rate can be adjusted between 12 and 125 impulses per minute (750 to 7500 impulses/hour).

   Control of the pump can be either by a simple ON/OFF switch or a timed output from a separate controller.

2. **From an impulse water meter.**

   This type of water meters generates impulses as water flows through.

   Water meters of this type have a "K" factor, which is the number of litres that will pass through the water meter between impulses being generated.

   - e.g. a meter with a "K" factor of 1 will generate impulses every 1 litre of water flow
     "K" factor 10 will generate impulses every 10 litres of water flow.

3. **From a 4 to 20 mA signal**

   - Impulse rate varies according to the signal rate, directly or inversely.

Not *all* PULSAtron pumps can operate in all the different modes described above. The ultimate selection of the pump required will depend on the capabilities demanded by the application.

Water Treatment Products Limited Equipment - Dosage Pumps

PULSAtron pumps are grouped into two distinct ranges.

PULSAtron and **PULSAtron Plus**.

PULSAtron pumps fulfil the basic requirement to dose liquid products and incorporate a number of different ranges offering many different output and pressure combinations along with a wide range of control options.

PULSAtron Plus pumps offer an extra dimension to incorporate additional control features such as cooling tower blowdown and biocide dosage within the pump itself – without the need for additional control equipment.

Click on the product range names to link to fuller details of each range.

Dosage Pump Selection

Water Treatment Products Limited has access to a vast range of dosage pumps via **Pulsafeeder**. The size of the range and the wealth of options available can make the choice of pump appear somewhat daunting. However, selection usually breaks down into simple steps.

1. How much chemical do you need to dose?
2. Against what pressure do you need to dose?
3. How is the pump going to be controlled?

The answers to these three questions usually direct you to the range – and the model within that range.

When you consider these questions, remember the following points.

- All rated outputs are specified against the maximum pressure rating. Thus an LD54 C^{Plus} pump is rated to deliver 4.7 litres/hour at a maximum pressure of 5.6 bar.
  - If you are not dosing against that pressure, e.g. the pump is doing into a cooling tower sump with just the injection fitting on the end of the dosage line, then the output delivered will be considerably higher than 4.7 litres/hour.
  - It is difficult to be specific about how much the pump will deliver as many hydraulic factors will affect the situation, just be aware of the fact that you will get more than you expect!
- When considering the pressure you are dosing into, don't forget the effect of the injection fitting on the end of the doing line as it will require some of the pressure that the pump delivers to overcome the resistance of the injection fitting.
  - Consider a recirculating system operating at 5 bar (it can often be difficult to ascertain exact pressures within a system at an injection point, but it is extremely important and you should make the end user aware of this and ensure that responsibilities for deciding operating parameters are well defined).
    - The plastic injection fitting will require approximately 1 bar of pressure to open it and inject chemicals.
    - Thus the pressure from the system plus the pressure required by the injection fitting is

      5 + 1 = 6 bar
    - If you select a C^{Plus} pump, it is only rated at 5.6 bar, so it is likely that the pump will not deliver into the system to be treated.
    - In general, allow a 1 bar reserve. Thus in the example above, you would need to select a pump capable of delivering at least 7 bar.

❖ Water Meter Dosing

- If you are dosing a system via water meter impulse, you need to carefully check that you will achieve the required dosage.
- In this application, the rated output in litres/hour is not the important parameter to consider.
  - What is important is the output per stroke, as one impulse from the water meter will usually effect one stroke of the pump. Therefore you need to ensure that one stroke of the pump will deliver sufficient chemical to dose the volume of water represented by one impulse of the water meter.
  - You also need to ensure that the water meter does not send more that 7500 impulses/hour to the pump to ensure that the pump is not overloaded and dosage missed.
- This combination of factors can be complicated to deal with. To make it easier to check whether you pump and meter selection is compatible with the desired dosage regime you need to establish, we have created a **Water Meter Sizing Guide** to do the calculations for you.

❖ Controller Dosing

- **PULSAtrol** and **PULSAtrol Plus** Controllers will effect dosing in two ways.
  - Via a direct timed output whereby the dosage achieved will be dependant on the time the pump is set to run for and the output of the pump.
- Via a water meter input to the controller. In this mode, the water meter input goes directly to the controller. The controller is able to activate dosage after each impulse or a number of inputs. The dosage activation is for an adjustable timed period. Again, we have created a **Controller Setting Guide** to do the calculations for you.

Installation

As with all equipment, the ultimate performance and reliability of the PULSAtron and PULSAtron Plus Dosage pumps will be greatly affected by the method of installation.

To that end we have compiled a **Dosage Pump Installation Guide** to ensure the installer considers all the points relevant to a successful installation.

Maintenance

PULSAtron and PULSAtron pumps have an excellent performance and reliability record. However, the application of a planned maintenance programme will ensure optimum results are obtained during the life of the equipment.

KOPkits are available for all pump models in all wet end material combinations and comprise

- Suction and discharge valve cartridges complete with O-rings
- Complete pump head
- Diaphragm
- Secondary O-ring seal
- Head screws and washers

All supplied in a convenient package as shown in the photograph.

Annual replacement of these components will keep the dosage pump operating at peak performance at all times.