Liquid Dosing Solutions

Continuous, Ratio or Batch Dosing of Low Liquid Flows

Bronkhorst®

Bronkhorst can provide different solutions for various types of dosing

Insulation market

Continuous dosing

A constant flow of liquid being dosed based on a fixed setpoint.
For the production of insulation panels, the manufacturer relies on the accuracy of a Coriolis Mass Flow Controller to ensure a consistent liquid flow for the duration of the entire production run. After switching to a Bronkhorst solution, the quality of the end product raised significantly and the amount of rejected end products has been decreased to a minimum.

Care products

Batch dosing

A small and repeatable amount of liquid flow in a one-per-time process.
Almost all homecare and personal care products consist of a mix of different ingredients created in a large production run using batch dosing. Traditionally, weighing scales are used to sequentially dose ingredients in a production vessel or individual product packaging. The Coriolis Mass Flow Controller acts as a weighing scale for flowing mass with direct control over the amount of flow into the vessel. And by using a separate Flow Controller for each ingredient, the dosings can be done in parallel, saving process time.

Water treament

Ratio dosing

Combining separate liquid flows in a constant mixing ratio.
For safe and clean drinking water, chemical additives are added in a specific ratio to the flow of produced drinking water. Too little additive does not give the required outcome, and too much additive is costly and can result in a chemical imbalance downstream.
In addition to continuous dosing, the exact amount of dosed additive is also depending on the main flow of produced water. By using an actual measurement of the main flow and the pre-set mixing ratio, the required amount of additive is calculated in real-time and accurately dosed into the main stream. The sanitary design of ES-FLOW ultrasonic flow meters makes these instruments ideally suited for this application.

Customer success story

Precise dosing of undiluted dye

During production of laundry care and cleaning products, the two most important requirements are repeatability and accuracy. This is to ensure a consistent colour of the end product while minimizing waste of very expensive dyes. With a Bronkhorst compact dosing solution, this production process has optimized the dye consumption while maintaining product quality.

"Exact additive dosing reduces the cost of my operation without risking my product quality."

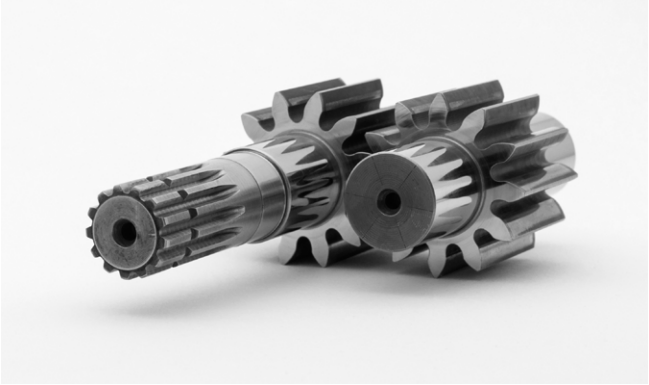
The benefits of Bronkhorst liquid dosing solutions

Introduction

For liquids, Bronkhorst is specialized in the measurement and control of (very) low flow rates. Our mini CORI-FLOW™ mass flow meters and controllers use the Coriolis measuring principle, covering flow rates from 50 mg/h up to 1000 kg/h. ES-FLOW™ instruments are volumetric liquid flow meters for flow ranges between 2 and 1500 ml/min. These instruments operate on an innovative measuring principle, using ultrasound in a very small, straight tube. Both measuring principles, as applied by Bronkhorst, are independent of fluid density, temperature and viscosity. Flow meters can be combined with integrated or separate control valves, close-coupled pumps and optional pressure meters with on-off valves.

Control valve or controlled pump?

The concept of using a straight forward flow controller is simple and economical. It requires a certain head pressure, which can be achieved by pressurising a vessel filled with liquid, for instance by using an inert gas blanket. In some applications using a control valve is not possible or not recommended. Over the years, Bronkhorst gained a lot of expertise in combining a (mini) flow meter of the ES-FLOW or (mini) CORI-FLOW series in a closed loop system with a pump that is suited to deliver a pulsation-free liquid flow. We will take care of electrical and mechanical connection, testing and optimization including the PID-integrated controller.
For fast dosing, we developed a third option: A pump is used to pressurize a liquid container, using a pressure meter to keep the pressure exactly and constantly at the desired level. The flow meter opens the on-off valve for the exact time that is required to dose a predetermined amount of liquid. The liquid flow meter precisely checks the dosage and adjusts the opening for the next batch, if required.
The alternative of using a pump for fluid transfer seems logical, but was not always advisable because of the pulsating flow pattern of most low-flow pumps. Bronkhorst offers Liquid Dosing Sets for (very) low liquid flow rates, consisting with control function, a pump, an optional particle filter and interconnecting materials. We will take care of electrical and mechanical connection, testing and optimization including the PID-integrated controller. In addition to a series of standard, low-flow pumps, a variety of pumps can be offered, depending on the flow rate, pressure, turndown or material of construction, required for the application.
The dosing solutions can operate either in analog mode or digitally via RS232 or fieldbus interface, integrated in the flow meter.



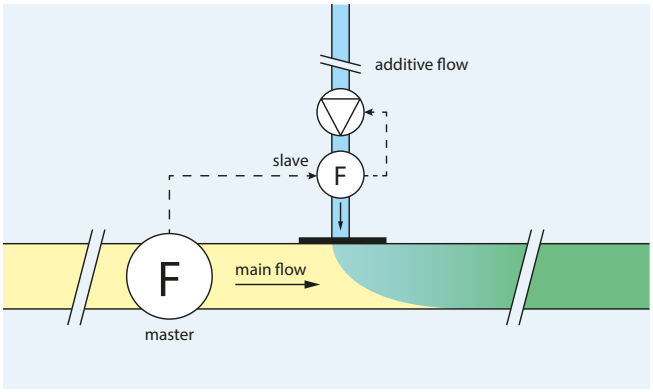
Pump gears: Mechanical and reliable, but a small deviation in the surface caused by wear or contamination can impact pumped volume if not corrected for.

Low flow, high accuracy

Bronkhorst offers highly accurate dosing solutions up to 30 kg/h, but also ensures high accuracy for flow rates down to 50 mg/h! To give you a better idea of how small this is: this is the equivalent of one water droplet per hour, dosed at a constant speed. Due to this feature, it is no longer required in some applications to dilute highly concentrated additives with water. Other possible advantages could be the reduction of waste of expensive additives and reducing the footprint of the dosing installation.

Blending fluid in master-slave processes

With a fixed mixing ratio, the amount of dosed additive (slave) needs to be corrected when the main flow (master) changes. Characteristics hereof are: real time correction and flow adjustment based on a master flow signal. Only dose what is required, no more preventative overdosing. Reduction of operation cost and consumption of (potentially) harmful chemicals. Additive container operates at ambient pressure, allowing for refills without interrupting operation.



Maintaining the perfect mixing ratio, based on real time measurements.

Modular Liquid Dosing Skids

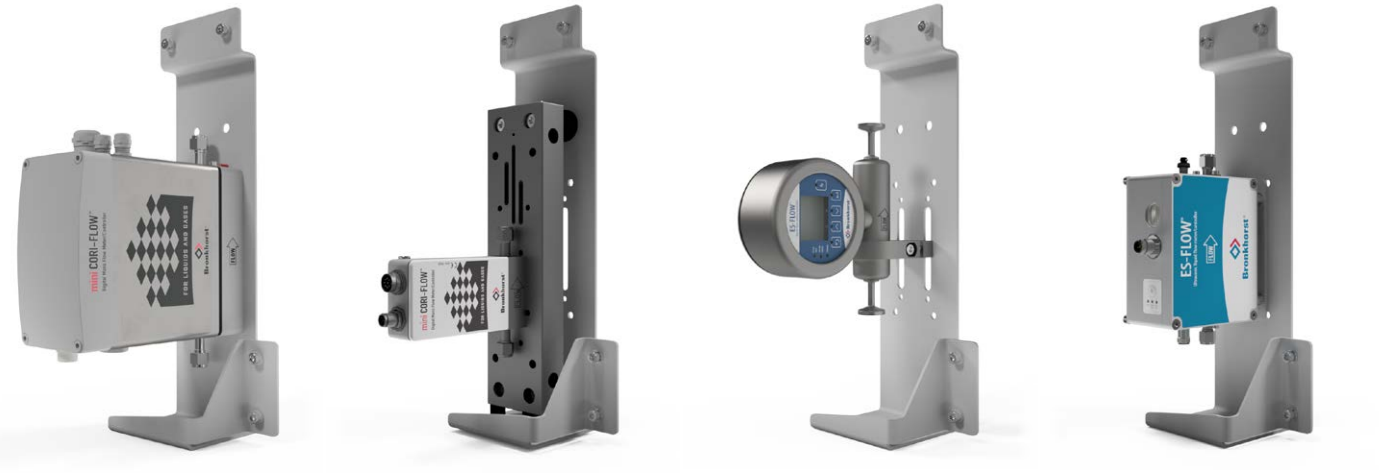
A modular dosing skid offers a cost-effective, adaptable, and reliable solution for precise dosing applications across various industries. Its modular design and integrated components enhance flexibility, scalability, efficiency, reliability, and space optimization, making it an ideal choice for diverse dosing needs.

The modular dosing skid allows for easy customization and configuration according to specific requirements. Its rack construction enables the integration of the liquid flow meter, control valve or pump, and optional pressure meter with on-off valve, needle valve, check valve, relieve valve and optional human/machine interface.

By incorporating all necessary components into the rack construction, the modular dosing skid alleviates the burden on the customer for mounting individual components. This streamlines the installation process, saving time and resources while ensuring consistency and precision in assembly. Customers can benefit from a ready-to-use solution that minimizes the complexities associated with integrating multiple dosing components, thereby accelerating deployment and reducing overall project lead times.

Example of a Modular Liquid Dosing Skid

Examples of MLDS modules



Flow metering modules
(Coriolis mass flow resp. ultrasonic volume flow meters with mounting brackets)

Optional storage container

Check valve & electrical shut-off valve

Junction box

Pump-assembly with pressure meter, pressure relief valve and by-pass

Liquid Dosing Sets (LDS)

Where a Modular Liquid Dosing Skid provides a complete, plug and perform solution, we can also offer a more basic dosing solution by combining a flow meter with a pump on a mounting plate or base block.
Bronkhorst Coriolis mass flow meters and ultrasonic volume flow meters have an integrated PID controller, providing the possibility of direct pump control. The flow meter uses a real-time signal, which makes this way of controlling the pump much faster than the traditional way of pump control.

ES-FLOW Flow Meter based LDS

"Measure what you pump – in real time"

Dosing the equivalent of a water droplet continuously over the period of an hour, every hour.

Liquid Flow Controllers

The most basic solution to dose liquid remains of course a liquid flow controller, i.e. a liquid flow meter with either an integrated or separate control valve. Such a liquid flow controller is the most economical and often the most compact solution, provided that there is sufficient pressure difference in the system. In our LIQUI-FLOW, ES-FLOW and mini CORI-FLOW brochures you can find more information about these options.

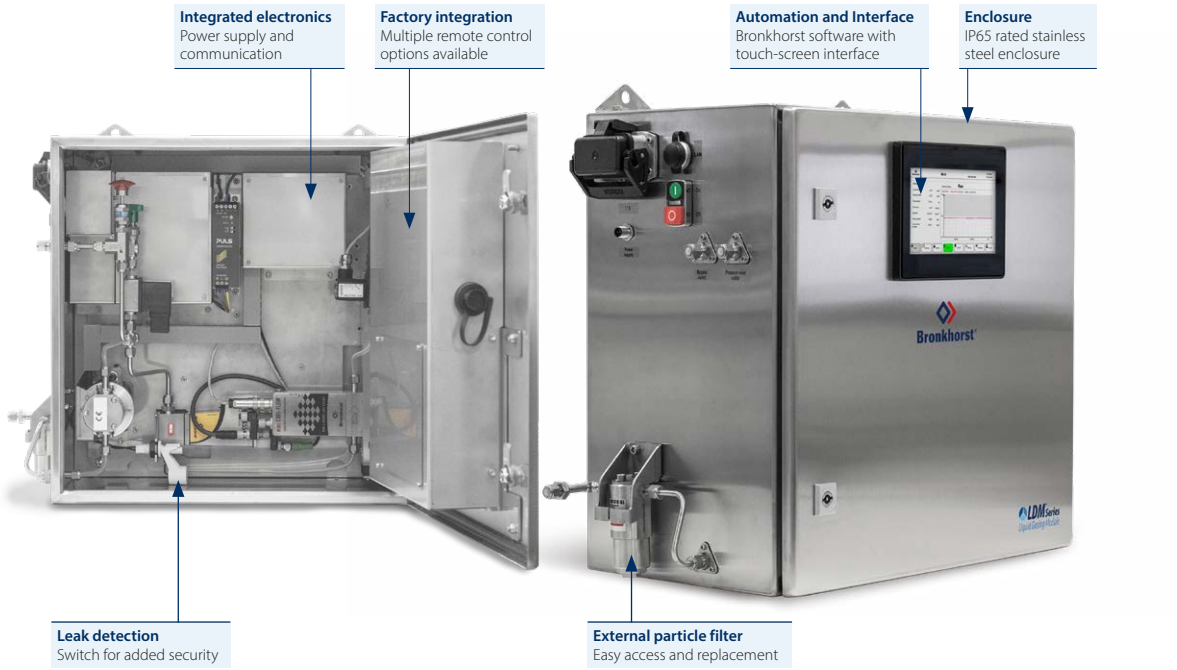
› Some pros and cons

- The ultrasonic ES-FLOW instruments measure volume flow, Coriolis instruments directly measure mass flow, LIQUI-FLOW instruments also measure mass flow but indirectly, using the thermal measuring principle.
- Coriolis technique offers highest accuracy and fastest response, whereas LIQUI-FLOW and ES-FLOW are more economical.
- ES-FLOW and mini CORI-FLOW both measure fluid independent, contrary to LIQUI-FLOW.
- ES-FLOW and LIQUI-FLOW require less differential pressure than mini CORI-FLOW.
- Mini CORI-FLOW and LIQUI-FLOW MFCs with integrated control valve are the most compact solutions.

mini CORI-FLOW Coriolis Mass Flow Controller

Turnkey Liquid Dosing Modules

Similar to the aforementioned Modular Liquid Dosing Skids, we can facilitate customers by integrating mass flow measurement and control equipment into boxes, modules or cabinets, designed in collaboration with our customers. Depending on the application, these space-efficient subsystems can be equipped with PLCs, pumps, filters, mixing chambers, etcetera. Also, the enclosure is subject to customers preferences, e.g. with optional polycarbonate window or protected against dust or water. We have gained a wealth of experience in the implementation of diverse customized solutions, for gas mixing and delivery applications, precise dosing of liquid chemicals or food additives, and many more.



FLUIFILL® Dosing Technology – The easiest solution for batch dosing

For the convenience of our customers, we developed FLUIFILL dosing control firmware for our liquid flow instruments. Just follow the simple, short auto-setup procedure for the flow instrument with batch dosing functionality, and you are ready to go.

Step 1	Step 2	Step 3
Set the required batch (volume or mass)	Enter the desired time (in seconds)	Choose the desired accuracy (percentage)

The filling will be done first-time-right. The instrument will continuously adapt to varying process conditions. Changing to different batch values or dosing times – of course, within the limits of the sensor and actuator – can be done without running a new aut-setup procedure.

Starting a new batch can be triggered by:

- Analog input signal
- External software trigger, e.g., via RS232 or FLOW-BUS
- Time repetition with a pre-set interval time
- External hardware trigger

Optionally there is a delay time setting for a delayed start of the following batch after a trigger signal.

FLUIFILL supports on-off valves as well as PID controlled valves. The firmware, however, can only run in combination with instruments that incorporate socalled MBC3 (or higher version) pc-boards. For instruments that still contain the previous generation (MBC2) Bronkhorst still offers CORI-FILL software.
Contact your local Bronkhorst distributor for the latest status on the implementation of MBC3 pc-boards.

Customer success stories

Accurate ratio dosing of a fuel additive

Ratio dosing solutions to ensure an optimal combustion and engine efficiency, without unnecessary waste of additives. The Liquid Dosing solution ensures remote monitoring and performance tracking including consumption data to schedule timely refills of the additive tank. The solution is IP65 and can be installed outdoors and in dusty conditions.

"The density measurement of the Coriolis mass flow meter can be used as an indicator for the concentration and quality of my additive."

Dosing in remote areas

One of our customers dosed liquid additives into a main stream, but the metering pumps were located in remote areas. Once a week, these pumps were manually adjusted to compensate for deviations in the main stream. The dosing solution with remote monitoring and control capabilities completely removed the need for travel and manual interventions. With the integrated controllers, the dosed amount of additive is automatically corrected based on the measured main stream.

"The remote monitoring and control functionality saves the time and effort of visiting remote locations for a standard check-up or pump adjustment."

High speed batch dosing of fragrance

A high speed production line suffered from uncertainties on dosed fragrance, increasing the need for manual quality inspections and discarding rejected products. A fast batch dosing solution now ensures the right fragrance dosage on every passing product and logging relevant parameters for quality monitoring purposes.

"The alarm functionality is really helpful to prevent bad production runs, and to pinpoint the potential problem."

Bronkhorst®

Bronkhorst High-Tech designs and manufactures innovative instruments and subsystems for low-flow measurement and control for use in laboratories, machinery and industry. Driven by a strong sense of sustainability and with many years of experience, we offer an extensive range of (mass) flow meters and controllers for gases and liquids, based on thermal, Coriolis and ultrasonic measuring principles. Our global sales and service network provides local support in more than 40 countries. Discover Bronkhorst®!

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