DATASHEET LIQUID FLOW METERS FOR MRNA VACCINE PRODUCTION A132

APPLICATION NOTE

Liquid flow meters for mRNA vaccine production

The Berlin-based company Knauer Wissenschaftliche Geräte GmbH manufactures mixing systems for mRNA vaccine production. By incorporating Bronkhorst liquid flow meters into their impingement jets mixing skids, they were able to measure the vaccine ingredients **accurately** and **reproducibly** under pharmaceutical conditions.



mRNA vaccines have been developed for several years now. Starting in 2020, because of the COVID-19 pandemic, this has been the first time to produce them on a worldwide scale. High-tech laboratory instruments of Knauer enabled the encapsulation of active pharmaceutical ingredients (APIs) such as mRNA into the fat globules to produce the vaccine, based on impingement jets mixing technology, where two flows collide at high speed in a mixing chamber. As the quality of nanometer-scale vaccine particles depends on **flow stability**, Knauer requested Bronkhorst to find a solution, based on liquid flow meters, for measuring component flows *accurately* and *reproducibly*.

Requirements analytical applications

Dosing pumps as part of the impingement jets mixing skids have to be monitored and controlled by accurate flow instruments which are **medium-independent**. Since we are dealing with a pharmaceutical application here, the internal **roughness of devices** is important, as well as having a **low dead volume** to ensure that no particles would get stuck and that no compounds are left behind in the skids.

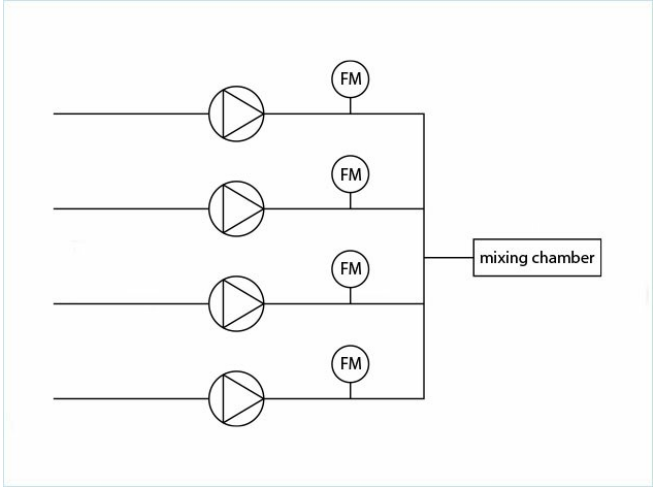
Important topics

- Accurate and reproducible dosing and pumping
- Fast & reliable switching of liquids
- Constant control of parameters

Process solution

Knauer's impingement jets mixing skids consist of high-pressure (HPLC) dosing pumps, Coriolis-based liquid flow meters, mixers, inlet & outlet manifolds, a washing system, and a frame to bring all components together. Bronkhorst provided Knauer with up to sixteen Coriolis liquid flow meters per skid.

To be able to comply with quality requirements in this pharmaceutical vaccine production process, it is mandatory to have a measuring part in addition to dosing with a HPLC pump. If the composition is slightly different or if there is a change in temperature or pressure, this will result in a different flow, so it is necessary to verify what is coming through.



Flow scheme

The compounds used in the impingement jets mixing process are always liquids, such as lipids in organic solvents, the API in water, and a terminator to stop building a surface around the mRNA. As the compositions are varied during the process, a medium-independent liquid flow meter is needed, and therefore Coriolis-based instruments are used.

In addition to a **high accuracy**, a **good reproducibility** of the liquid flow meters is important to be able to obtain a continuous vaccine quality. The Coriolis-based liquid flow meters meet these requirements and have several other benefits. The internal surface roughness of < 0.8 µm for the MI140 mini CORI-FLOW is very decisive in this pharmaceutical application, as well as a low dead volume in these compact instruments. Furthermore, the possibility of equipping these flow meters with a Profinet interface gives the option of connecting the devices with the customer's PLCs. In addition, Bronkhorst supplied ES-FLOW ultrasonic flow controllers for CIP (clean-in-place) purposes, to be able to flush the process lines with liquid cleaning agents between different batches.



Source: Knauer Wissenschaftliche Geräte GmbH

Knauer's LNP-skids are mainly for production equipment worldwide, but also for pilot-scale and research. By using the different liquid flow meters, it is possible to produce vaccines in a large scale, and it is also possible to use these instruments in the research phase, where flow meters with extreme low flows are needed.

Knauer already knew Bronkhorst as a supplier of well performing Coriolis-based flow meters, so the choice to include these instruments in their skids was easily made. To get an even better understanding of the resulting benefits when combining pumps with flow meters Bronkhorst trained sales representatives at the site of Knauer.

Knauer: *"The most important functionalities for high quality Lipid Nanoparticle (LNP) production systems are a very precise pumping technology, fast and reliable switching of liquids and a constant control of parameters via software and the Bronkhorst liquid flow meters."*



Source: Knauer Wissenschaftliche Geräte GmbH

Recommended Products



MINI CORI-FLOW™ M14

Flow range 0…30 kg/h

Pressure rating 200 bar

Independent of fluid properties

High accuracy, fast response



MINI CORI-FLOW™ MI140

Flow range 0…30 kg/h

Pressure rating 200 bar

Independent of fluid properties

IP66/IP67 housing, terminal strip conn.



ES-FLOW™ ES-FLOW METER WITH PUMP

Min. flow 2 ... 100 ml/min
Max. flow approx. 1500 ml/min

Compact, integrated dosing solution

Direct pump control

Do you need advice on gas flow meters for pharmaceutical applications? Contact us

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