Plastics and Rubber Market

Mass flow and pressure measurement and control

Bronkhorst®

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An introduction to Bronkhorst®

Bronkhorst High-Tech B.V., experts in low flow fluidics handling technology, have over 35 years experience in designing and manufacturing precise and reliable measurement and control equipment. With the widest range of mass flow and pressure meters and controllers available on the market Bronkhorst offers innovative solutions for many different applications across a great many different markets. Our instruments are manufactured to customer specifications with models that are suitable for use in Laboratory, Industrial and Hazardous Area environments. In addition, the company provides tailor-made, complete fluid control solutions for O.E.M. systems.
Bronkhorst has a wealth of knowledge and an enviable worldwide reputation within the plastics and rubber market. In this leaflet we will illustrate that by presenting some typical applications.

Applications in the plastics and rubber market

Machine for hollow plastic profile production

Bronkhorst offers:

- Accurate dosing of liquid additives, e.g. colorants, plasticizers, stabilizers and processing aids.
- Surface treatment of plastic textiles, food and beverage packaging, parts for the automotive industry, etc. by means of vapor delivery systems
- Pressure control in plastic extrusion and/or molding processes, e.g. for the production of rigid, lightweight PVC or aluminum profiles
- Gas flow control (N_2, Air or CO_2) for polymeric foam products such as mattresses, sponges or car seats

Coriolis mass flow meters / controllers for liquids and gases

Bronkhorst offers a portfolio of instruments providing highest accuracy of mass flow metering for liquids and gases. (mini) CORI-FLOW™ utilizes advanced Coriolis type mass flow sensors to achieve unsurpassed performance, even with changing operating conditions in pressure, temperature, density, conductivity and viscosity. The devices are offered with or without integral control valve as well as analog and digital communication. The electronic control function forms part of the normal circuitry in the flow meter. The instruments can be offered in ranges from 5 g/h up to 600 kg/h (full-scale values). (mini) CORI-FLOW™ is used in various liquid additive dosing applications in combination with control valves or pumps. Fluids such as **colorants, plasticizers, stabilizers and processing aids can be accurately fed into reactors or proportionally mixed with the bulk material flow**.
Bronkhorst low flow Coriolis instruments are also used for **foam extrusion (supercritical CO_2 dosing), synthesis of monomers and dosing release agents in molds.**

Coriolis Mass Flow instruments

Mass flow meters / controllers for gases

Bronkhorst® Mass Flow Meters (MFMs) and Controllers (MFCs) are available in the widest range offered on the market for flows from 0...1 mln/min up to 0...400 m^3_n/h and from low operating pressures (vacuum) up to 700 bar. Bronkhorst® Mass Flow Controllers excel in:

- **Stability**
- **Maintainability**
- **Quality**

The unique control valves are modular in construction. For applications in the plastics and rubber market, Bronkhorst® MFMs and MFCs are being used for **control of gases such as Nitrogen, Air and CO_2 for the production of polyurethane, polyvinyl and other sorts of foam products**. Bronkhorst® instruments are available with analog and digital in-/output. The digital instruments have a basic pc-board, containing all of the general functions needed for measurement and control. In addition to the standard RS-232 output the instruments also offer analog I/O. Furthermore, an integrated interface board provides DeviceNet™, PROFIBUS DP, PROFINET, Modbus, EtherCAT® or FLOW-BUS protocols. For local readout and/or operation, Bronkhorst® instruments can be supplied with close-coupled or integrated display with control buttons (see picture of MASS-STREAM™ MFC).

For installations where extra protection is required, Bronkhorst offers various product series with IP65 weatherproof housing or even according to ATEX Zone 1 or 2 classification for application in hazardous areas. For example, for the **production of granulated polypropylene Bronkhorst® EX-FLOW instruments are used to control the hydrogen and ethylene flow.**

Digital Mass Flow Controller for gases, model F-201CV

Gas flow meter/controller series D-6300 with integrated display and push buttons for local operation

Electronic Pressure Controllers

The EL-PRESS Series Electronic Pressure Meters and Controllers have a well-proven compact thru-flow design and are available in pressure ranges from 100 mbar up to 400 bar. The Pressure Controller performs with high accuracy and repeatability; it must be specified for forward pressure control (P-600 series) or backward pressure control (P-700 series).

The EL-PRESS Electronic Pressure Controllers are compact devices, constituting an integrated pressure transducer and control valve for Kv-values up to 6,6 x 10^{-2}. For higher flows we recommend to use a separate P-500 pressure transducer, preferably to be mounted outside the flow stream to eliminate frictional losses, and a special, patented Bronkhorst® control valve for Kv-values up to 6,0. For applications where low differential pressure is combined with a high flow a bellows operated valve (series F-004) can be used.

In the plastics and rubber industry, Electronic Pressure Controllers are frequently used in **plastic extrusion and/or molding processes, e.g. for the production of lightweight but rigid (hollow) profiles, car parts or plastic crates and boxes.**

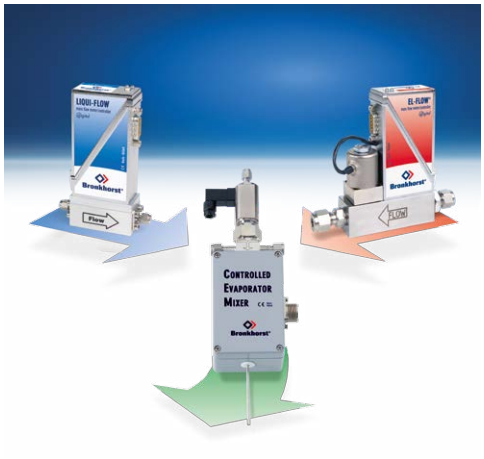
EL-PRESS series Forward Pressure Controller

Vapor delivery systems

Bronkhorst has developed a unique patented system to realise Mass Flow Control of Vapours: the CEM-system. 'CEM' stands for Controlled Evaporation and Mixing. In plastics and rubber applications the CEM-system is a reliable and flexible means for applying a **water repellent layer to fabrics, a scratchproof coating on automotive parts or the lamination of tubes for toothpaste, cosmetics or food products.**

The CEM-system is built up from a Mass Flow Meter for liquid, a Mass Flow Controller for the carrier gas and a mixing chamber in which a liquid flow is injected in the carrier gas flow. Subsequently the mixture is led into a temperature-controlled heating device, which results in complete evaporation. The system is completed by a Power Supply Readout Unit with flow indication and set-point facility. This way of vapour source control is very accurate, reliable and fast, because the amount of liquid and gas is measured and controlled using thermal Mass Flow Controllers. The system can be applied for atmospheric as well as pressurized systems. There are three series (10, 100 and 1000 Watt), covering liquid ranges up to 1200 g/h of water or 1700 g/h of Methanol.

Based on the CEM-technology as described above, Bronkhorst designed a new series of Vapor Delivery Modules. These compact sub-systems incorporate the components of the CEM-System and more! Besides gas and liquid flow controllers and the temperature controlled evaporator, the VDM-Series feature integrated power supply with display (1.8" TFT) and control functions. As an option, the unit offers local or remote trace heating temperature control. The compact, 'plug and work' module can generate (saturated) vapor flows within the range of 100 ml_n/min up to 10 l_n/min. It can be applied for atmospheric or vacuum processes and is capable of evaporating mixtures and even solids, dissolved in solvents.



Principle of a CEM (Controlled Evaporation Mixing) system

Vapor Delivery Module (VDM)

Bronkhorst®