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“dedicated to customer satisfaction, quality and sustainability”

FAST RESPONSE MFCs FOR OEM-APPLICATIONS

The Mass Flow Controllers of the EL-FLOW *Base* series are standard and straightforward instruments. They provide accurate measurement, fast response and stable control in common gas flow applications. EL-FLOW *Base* is an economical solution for installation in (OEM) systems e.g. in coating or welding applications. The instruments operate on the principle of thermal mass flow measurement in ranges starting from 0,2...10 ml_n/min up to 1,4...70 l_n/min air-equivalent. They offer analog I/O-signals as well as digital RS232 communication and/or Modbus-RTU as a standard feature. EL-FLOW *Base* is a member of Bronkhorst's most popular and field proven EL-FLOW[®] series, which was introduced in 1981 and can still be serviced, even after more than 25 years.



mini CORI-FLOW[®] - SMALLEST CORIOLIS INSTRUMENTS YET

Our new highly compact and accurate mini CORI-FLOW series are believed to be the smallest Coriolis effect instruments on the market. Offering a range of purpose-made meters and controllers, mini CORI-FLOW has been specifically developed to precisely measure very low flow rates, down to a few grams an hour, although larger models will handle up to 30 kg/h and beyond. The unique design of the Coriolis sensor delivers unsurpassed performance, irrespective of changing operating conditions with regard to pressure, temperature, density, conductivity and viscosity.

Suitable for both liquid and gas flow applications and capable of bidirectional measurement, mini CORI-FLOW instruments are equipped with robust IP65 weatherproof housings and available with ATEX approval for use in hazardous areas. The mass flow controllers feature adaptable PID

controls for regulating integral or separately-mounted electronic control valves.

Notable for their high accuracy and fast measuring signal, traditional Coriolis mass flow meters tend to be large, requiring robust mountings and sizeable concrete plinths, and are typically applied to medium-to-high flow rates. Our new mini CORI-FLOW is around 16x smaller than normal, with a basic footprint of just 64 x 32 mm and an overall height of 144 mm. Moreover, both meters and controllers have been developed to cover the needs of the low flow market, down to 0,4...20 g/h, with different models providing overlapping maximum flow rates up to 0,3...30 kg/h. The mini CORI-FLOW series features our usual state-of-the-art digital technology, offering standard fieldbus interface options and additional functions such as totalisation and alarms. Typical applications include research laboratories, pilot plants, semiconductor and fuel cell

processing, food and pharmaceutical industries, analytical installations, micro-reactors, plasma surfacing technology and anywhere requiring direct mass flow measurement, independent of fluid properties.

www.bronkhorst-cori-tech.com



◇ MASS VIEW - HIGH TECH "VA" REPLACEMENT

Bronkhorst has developed a no-nonsense digital alternative to the conventional VA meter (variable area meter) or rotameter, a design that dates back to the 19th century. Employing the latest OLED (organic light emitting diode) technology, as used in mobile phones and MP3 players, MASS VIEW® flow meter series incorporates a digital bar graph of actual gas flow, which is clearly visible from all angles, as well as indicating flow units, fluid type, alarms and totalised figures.

Also available with an optional built-in needle valve for flow control duties, it is designed to mimic the straightforward features and vertical format of the VA meter, but with the considerable added benefits of an electronic output signal, measuring accuracy as high as $\pm 2\%$, virtual independence from gas temperature and pressure variations, freedom from parallax error and

inherently safe construction, with no fragile glass components in the flow path. For many industrial processes and chemical plants, our new MASS VIEW® will eliminate the relative inaccuracy of VA meters, the need to recalibrate for different gases and the safety risk of ruptured glass tubes, at a price lower than that of a variable area meter and separate transmitter. For OEMs, it offers the option of incorporating more modern, aesthetic gas flow measuring instruments into their equipment, presenting a more appropriate, high technology image. The basic advantages of the VA meter are its relatively low cost, reasonable accuracy, simplicity of design, low maintenance and ease of installation. However, one drawback is that flowmeter accuracy degrades when fluid temperatures and pressures fluctuate, whilst there is also a problem of parallax error when taking readings from different viewpoints. In addition, glass and plastic tubes often break in usage. Thus, we felt there was scope for a more high tech alternative

to VA meters, employing similarly straightforward visual indication, although measuring mass flow instead of volume. So our MASS VIEW® series operates on the principle of direct thermal mass flow measurement, with no by-pass for potential blockages, and requires no correction for temperature and pressure. With flow ranges starting from 0,01 up to 200 l_n/min the instruments offer a standard accuracy of $\pm 2\%RD$ if the flow is higher than 50% of its maximum full scale and $\pm(1\%RD + 0.5\%FS)$ on lower flows. Power consumption is low and mechanical process connections are fitted for straightforward VA meter replacement.



www.massflow-online.com

◇ IN-FLOW^{CTA} - MASS FLOW METERS AND CONTROLLERS FOR INDUSTRIAL APPLICATIONS



The Mass Flow Meters and Controllers of the IN-FLOW^{CTA} series are of rugged design (IP65) for use in pilot and production plants in industrial environments or even in Zone 2 hazardous areas (ATEX cat. 3).

The instruments operate on the principle of direct thermal mass flow measurement (no by-pass). An advantage of using this type of sensor is that the instruments measure direct mass flow, without the need of temperature and pressure correction. Mass Flow Meters can be supplied in ranges starting from 10...200 ml_n/min up to 50...5000 l_n/min air-equivalent. Mass Flow Control loops can be offered up to 4...200 l_n/min air-equivalent as compact controller and up to 5000 l_n/min with separate control valve.

Basically the IN-FLOW^{CTA} Mass Flow Meter consists of a straight tube. Two stainless steel probes protrude inside the flow channel; a heater probe and a temperature sensor probe. A constant temperature (ΔT) is created between the two probes and the energy required to maintain this ΔT is

proportional to the mass flow rate. Based on this concept, mass flow can be measured with low pressure drop, mainly caused by the gas fittings and the mesh screens which are incorporated for flow conditioning. Compared to traditional thermal MFMs and MFCs with by-pass, the direct measuring IN-FLOW^{CTA} is less sensitive to humidity and contamination.

The main digital pc-board on the instrument contains all of the general functions needed for measurement and control. It has analog I/O-signals and also an RS232 connection as a standard feature. In addition to this there is the possibility of integrating an interface board with DeviceNet™, Profibus-DP®, Modbus-RTU or FLOW-BUS protocol.

◇ INTEGRATED LIQUID DOSING SYSTEMS

Liquid dosing systems, comprising a flowmeter, pump and control package, offer a precise, automated method of proportionately dosing reactants, catalysts and other additives into a main fluid stream, without the need to pressurise the liquid source. They are widely employed in the chemical, offshore, food processing, pharmaceutical and water industries, as well as analytical laboratories. However, there is inherent difficulty in sourcing the components separately, then integrating them together, let alone pinpointing exact spheres of responsibility amongst the different suppliers, should the system fail. Now, we have introduced fully integrated liquid dosing systems, which are built from carefully matched components, factory tested by ourselves and delivered as a complete working system, ready for installation from inlet to outlet. It offers a highly cost-effective

solution for dosing applications and non-quibble single point responsibility for all components. Our dedicated dosing systems cover a liquid flow range from mere nanolitres, right up to a substantial 600 kg/h. Each consists of a flowmeter from the proven LIQUI-FLOW® or CORI-FLOW® series, including integrated PID controller and batch counter, together with a gear pump, a check valve to avoid backflow, a filter of the correct mesh type and size, and all interconnecting material. For smaller flow ranges, we fit the Bronkhorst LIQUI-FLOW® rotary displacement pump, which is virtually pulsation-free in operation and readily applied for low viscosity fluids. In addition, a complete series of pumps is offered for applications that require higher flow rates, higher pressures, wide control ranges or entail aggressive fluids. To guarantee safe use and long durability of the pump unit, the mass flow instrument has its response alarm enabled to stop the

pump when flow is not within a pre-set band or if there is a blockage downstream. System control is achieved by using the integrated controller function on the pc-board of the flowmeter, which can be optionally equipped with various fieldbus interfaces. It all adds up to a highly accurate, thoroughly dependable solution.



◇ INDUSTRIAL STYLE PRESSURE AND LIQUID FLOW METERS / CONTROLLERS

Bronkhorst High-Tech introduced a new line of pressure meters/controllers and liquid flow meters/controllers for use in industrial environments or even in Zone 2 hazardous areas, due to their ATEX category 3 approval. Both series are equipped with a rugged, industrial style (IP65) electronics housing.

The instruments are based on the successful EL-PRESS and LIQUI-FLOW series. As a standard they are equipped with a pc-board for both analog and digital communication. The main board can be easily extended with an interface board for DeviceNet™, Profibus-DP®, Modbus-RTU or FLOW-BUS. Several alarm, counter and diagnostic functions available as a standard. For users of digital instruments Bronkhorst offers free, easy-to-use software for configuration, monitoring and operation.



The pressure meter/controller is equipped with a diaphragm type piezo-resistive pressure sensor, suitable for pressures from 2...100 up to 8...400 bar. By utilising the integrated PID-control function the desired pressure, upstream or downstream, can be controlled with an integrated control valve or a close-coupled valve for applications with extremely low or very high ΔP . The control stability is better than 0.1%!

The liquid flow meter/controller has a stainless steel sensor with a minimized internal volume. These modular instruments are available for flow rates from 0,25 g/h up to 1000 g/h, with a pressure rating of 100 bar. Eight calibration curves for different media can be stored on the pc-board. The accuracy is better than 1% FS and the response time for the controller is less than 2 seconds.



◇ BRIGHT - COMPACT LOCAL READOUT AND CONTROL MODULES

The objective for the development of the new R/C-module was to offer a modern, economical alternative for peripheral Readout/Control electronics with integrated power supply. Furthermore it should comply with the demand for local indication of the actual flowrate and/or totalised fluid consumption.

Bronkhorst High-Tech designed the new R/C-module, fulfilling these requirements, and more! The module not only allows reading of actual and total flow, simultaneously, but also features local operation, i.e. change of setpoint, counter reset, setting of engineering units, fluid name and tag number, etc. Four push-buttons at the right side of the device give access to a user-friendly menu.

The bright 1.6" display is clearly visible over a wide angle, due to state-of-the-art OLED-technology. The weatherproof (IP65) housing makes the module suitable for use in industrial areas and the module can be mounted on the instrument or, using an optional mounting kit, on an adjacent wall or panel and on the pipework.



◇ IQ+FLOW - WORLD'S SMALLEST MASS FLOW AND PRESSURE CONTROLLERS

Equipment manufacturers are looking for compact solutions to monitor or control mass flow or pressure in their system. Due to the use of micro solid state technology (MEMS), Bronkhorst High-Tech has been able to halve the footprint dimensions of conventional gas flow and pressure meters/controllers. The combination of a thermally balanced chip-sensor with integrated digital electronics features high accuracy, fast response and a very stable zero. Besides these compact instruments the modular IQ+FLOW series offer the possibility of constituting bespoke designs. In line with a customer's requirement a selection of functional modules can be mounted on a compact manifold. The IQ+FLOW concept offers the following functional modules: gas flow meter,

pressure meter, control valve, shut-off valve, three-way valve, mixing chamber. The "plug and play" assembly ensures space efficiency, cost reduction and a minimum of potential leak points. Example of typical application: flow/pressure control in Gas Chromatography systems.

Most recent development is the IQ+FLOW Mass Flow Meter (MFM) for liquids according to the microfluidic concept.

The straight, duplex steel sensor tube has an internal volume of approx. 1 mm³ and operates on the thermal measuring principle. Due to its high pressure rating of 1000 bar the MFM is suited to HPLC systems. The instrument is equipped with a digital pc-board, offering high accuracy and excellent temperature stability. The RJ45 connection is used for power supply and for both analog and digital (RS-232 & RS485 Modbus) communication.

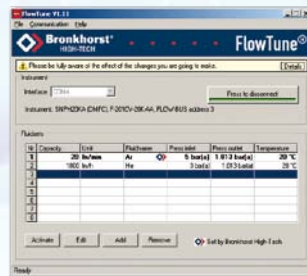
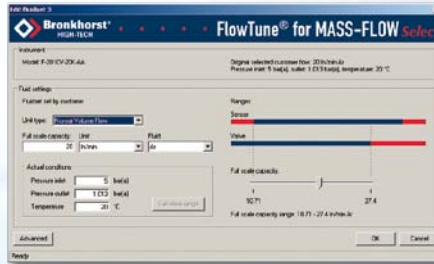


◇ MULTI FLUID / MULTI RANGE GIVES FLEXIBILITY AND COST REDUCTION

Digital Mass Flow Meters and Controllers for gases of the Mass Flow Select series offer greater flexibility for user selection of both flow ranges and gas types. As a result of this new 'Multi Fluid Multi Range' option in combination with an extended rangeability (up to 187.5:1), Original Equipment Manufacturers (OEMs) are able to drastically reduce the variety of spare instruments they keep on stock and thus reduce the cost of ownership. Users of MFCs in pilot plants or laboratories can rescale their instruments on site, saving time and money for dismantling and recalibration.

For the convenience of the user, Bronkhorst High-Tech has developed a software tool called FlowTune. By hooking up the instrument to the RS232 port of a lap-top and running

this freeware configuration tool, the selection of different flow ranges is as simple as 1, 2, 3.

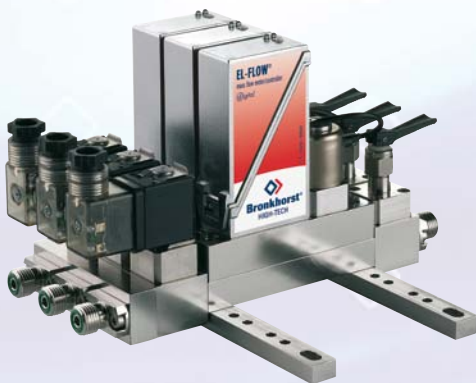


The new instruments, covering flow ranges from 0...0,7 ml_n/min up to 0...1670 l_n/min, are available in two configurations.



The EL-FLOW Select series have a housing designed for laboratory and clean processing conditions, the IN-FLOW Select series are of rugged design according to IP65 (dust- and waterproof). The latter are also ATEX Category 3, approved for use in Zone 2 hazardous areas. In addition to the standard analog I/O-signals and the RS232 connection, there is the possibility of integrating an interface board with DeviceNet™, Profibus-DP®, Modbus-RTU or FLOW-BUS protocol.

◇ FLOW-SMS - SPACE AND COST SAVING



By means of the innovative mounting concept FLOW-SMS a variety of components for mass flow and pressure measurement and control can be assembled to constitute a very compact gas or liquid delivery system. On a lightweight but still rugged mounting rail system one or more mass flow or pressure sensor/control modules can be combined with mixing chambers, (pneumatic, electrical or

manual) shut-off valves, filters or any other functional module as per customer's request. Flow ranges can be selected between approx. 0...5 ml_n/min up to 0...50 l_n/min or even higher. In case a pressure sensor or controller is included, the pressure range can be chosen between 0...100 mbar and 0...10 bar absolute or gauge.

The three major criteria for development – space efficiency, service friendliness and flexibility of expansion or modification – are realized within a compact, top-mount design.

FLOW-SMS systems can be configured for up to nine channels. In agreement with the customer, Bronkhorst High-Tech will supply the completely assembled systems tested on functionality and leak tightness, ready to plug and perform.

Customers will not only benefit the space efficiency but also a reduction of labour for pipe installation and testing. By means of the customer's flow chart, Bronkhorst will realize the "LEGO-principle" fluid delivery or mixing system - accurate, reliable and well documented.



This example of an 8-channel FLOW-SMS system illustrates the variety of functional modules.



INFORMATION

For more information about our products, literature requests, demos, product training, etc., please do not hesitate to contact us or visit our website.

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Trade Shows 2010

1-4 March 2010
Pittcon – Orlando, FL/USA

3-5 March 2010
PV-EXPO - Tokyo, Japan

23-26 March 2010
Analytica 2010 - München, Germany

19-23 April 2010
Interkama - Hannover, Germany

18-20 May 2010
Sensor+Test - Nürnberg, Germany

6-9 September 2010
Miconex 2010 - Shanghai, China

21-24 September 2010
ILMAC - Basel, Switzerland

28 September - 1 October 2010
Het Instrument - Amsterdam,
The Netherlands

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THE BRONKHORST PRODUCT LINE

Bronkhorst High-Tech B.V. was established in 1981 and, since those early days, it has enjoyed steady and continuous growth, with regard to both market share and corporate size. It now offers the most extensive product range of thermal mass flow meters and controllers on the market. Numerous styles of both standard and bespoke instruments can be offered for applications in laboratories, universities, pilot plants, industrial and hazardous areas. The measuring range for these instruments can be selected between 0...0,7 ml_n/min and 0...10000 m³_n/h for gases and 0...30 mg/h up to 0...20 kg/h for liquids.

Bronkhorst's Coriolis Mass Flow Meters/Controllers for gases and liquids have a measurement/control capability of 0,4...20 g/h up to 0...600 kg/h.

Furthermore Bronkhorst offers pressure transducers and controllers with a minimum range of 0...100 mbar and a maximum range of 0...400 bar. The innovative "CEM" Vapour Delivery System is suitable for mixing liquid flows of 0,25...1200 g/h with a carrier gas, resulting in an accurately controlled vapour flow of 50 ml_n/min up to 100 l_n/min.

www.bronkhorst.com

BRONKHORST HIGH-TECH WORLD WIDE

Bronkhorst High-Tech is a truly worldwide organisation with its Headquarters being located in the town of Ruurlo in The Netherlands and with a total (worldwide) headcount now exceeding 300 employees. Our Customer Service Department offers "round-the-clock" support, seven days a week, to customers in every corner of the world.



Our specialist teams are available to you to ensure pre and post sales support with diverse needs, such as application advice, on-site inspection & calibration, start-up assistance and user training courses.

The Bronkhorst organisation spans the globe, with wholly-owned operations in The Netherlands, Great Britain, France, Switzerland, northern Germany, the USA, China, Japan and Taiwan, whereby local expertise and service is offered. In addition, Bronkhorst High-Tech has built up an extensive complementary network of distributors and service stations across every continent, contributing toward a formidable worldwide team and establishing Bronkhorst's global market presence. A team with a passion for mass flow measurement and control technology, dedicated to customers and with commitment to providing total solutions rather than just individual components.