



## CORIOLIS FLOW MEASUREMENT

**Small - Revolutionary - Highly Accurate:  
Precise measurement  
of smallest mass flows**

**It's a well known fact – Coriolis Flow Meters are unbeatable when high accuracy is required. But it's also a fact – until now there were no instruments on the market capable of measuring >0 kg continuously and reliable. With a simple but ingenious idea Heinrichs Messtechnik has managed to close this gap. It's a new and revolutionary design that has enabled the world's smallest dual bent Coriolis Flow Meter. And all this with even lower costs.**

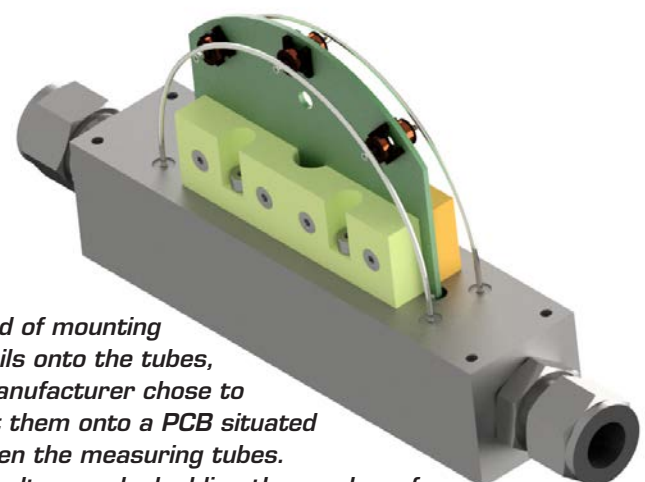
In 99,9% of all cases where high accurate measurements of very low mass flows are required, Coriolis Flow Meters are the first choice. However, this choice also comes with a price premium. The current problem is that the state-of-the-art stipulates the use of dual-tube technology, where the magnets are mounted to one tube with the exciter and sensor coils to the other, but this approach has a decisive disadvantage; the smaller the tube diameter and therefore the flow becomes, the greater is the influence of the components mounted to them.

For example, where extremely small flow rates demands tube diameters of just 1 mm, the vibrating behavior of the coil weights can influence the measurement results significantly. "Therefore it is common practice to use single tube systems for these applications, in which the coils are mounted to the chassis of the sensor.

However, this systems also has significant disadvantages! With the use of a single measuring tube the influence of external interferences is increased dramatically. When the second tube, serving secondly as a measurement reference, is omitted, the sensor coils must be mounted on to the chassis of the enclosure making the sensor more susceptible to vibrations and other disturbances. Due to the sensitivity of single tube Coriolis sensors, a costly mechanical decoupling is often required, rendering them inappropriate for many applications.

### **Because they know what they doing!**

The challenge was therefore to find a means of unifying a dual tube design with very small diameter tubes, reducing the sensitivity of external disturbances and allowing accurate measurements of amounts >0kg. The fundamental problem lies in the weight of the coils, which when compared with tube diameters of 1.5mm or less present a significant weight. To reduce this sensitivity whilst simultaneously delivering accurate measurements at very small flow rates, Heinrichs Messtechnik has heaved the dual-tube Coriolis principle to a new level. In this new state-of-the-art technology, the sensor coils are no longer mounted onto the tubes, but rather between them, thus freeing the measurement from the influ-



*Instead of mounting the coils onto the tubes, the manufacturer chose to mount them onto a PCB situated between the measuring tubes. By simultaneously doubling the number of pick-up coils from two to four, the resolution is increased significantly.* Source: Heinrichs Messtechnik GmbH

ence of the coils weight allowing for extremely small tube diameters in dual-tube design.

The measuring tubes themselves are burdened only with very light magnets, which, with a weight of only 0.08g, have no influence on the vibrating behavior of the tubes.

Another PLUS: By mounting the coils onto a static printed circuit board – in contrary to the standard market concept - there are no flexible wires in the system capable of vibrating at the same frequency as the measuring tubes. This approach additionally enables the use of four sensor coils instead of two, as is usually the case with dual-tube Coriolis, providing a higher resolution.

### Vibrations – so what!

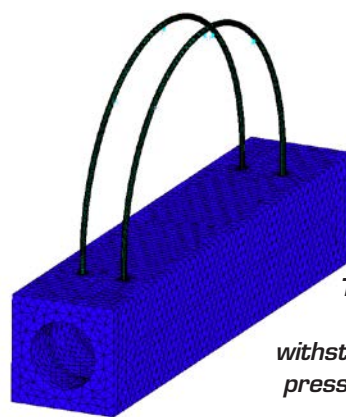
The innovative Dual Pipe Design of the mere 150 mm long High Performance Coriolis (HPC) from Heinrichs Messtechnik is insensitive to shocks and vibrations and allows high accurate measurements with deviations of just  $\pm 0,1\%$  of the actual measured value.



*Heinrichs Messtechnik GmbH developed the smallest dual-tubed-Coriolis-Mass-Flowmeter in the world: The High Performance Coriolis* Source: Heinrichs Messtechnik GmbH

A rather cautious value. In the meantime long-term tests have shown that “the little one” can achieve accuracies down to  $\pm 0,05\%$  of

the actual measured value. Furthermore, the sensor shows insensitivity to temperatures of up to 180°C and to pressures of up to 600 bar where other meters on the market have long since quit service. With a zero point stability between 0,001 and 0,005 kg/h – mechanical de-coupling and frequent re-calibrations are a thing of the past. The high resonance frequency of over 200Hz prevents injected vibrations from generating error messages. The HPC mainly consists of a massive stainless steel block



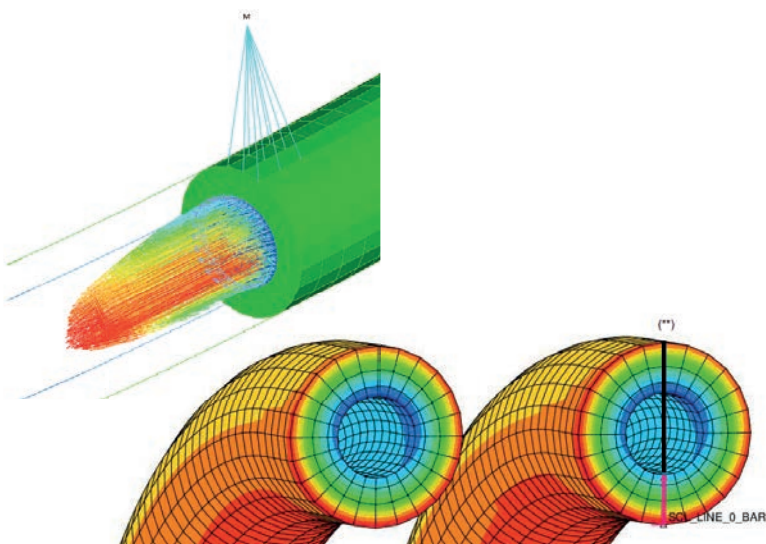
*With the exception of the laser welded measuring tubes, the HPC consists essentially of a solid drilled and tapped stainless steel block. The result is an extremely robust device capable of withstanding temperatures and pressures of up to 180 °C and 600 bar respectively.*

Source: Heinrichs Messtechnik GmbH

With the exception of the laser welded measuring tubes, the HPC consists essentially of a solid drilled and tapped stainless steel block. Furthermore, the HPC has been stripped of a splitter at the inflow of the tubes, instead possessing a reservoir – in which the process pressure distributes the exact fluid into the measuring tubes, hence preventing flow disturbances generally caused by splitters.

### High Accuracy for small money

All meters on the market – regardless of whether single or dual tube systems – have one thing in common: a high purchase price. Not with the HPC.



*The whole development phase took a mere 1.5 years.  
To achieve this short development time Heinrichs  
Messtechnik utilized the latest simulation technology.*

Source: Heinrichs Messtechnik GmbH

The whole development phase took a mere 1.5 years. To achieve this short development time, Heinrichs Messtechnik utilized a state-of-the-art simulation technology.

With the aid of this technology the required number of prototypes was drastically reduced, so reducing the development costs significantly. Furthermore, simulations, which are calculated 100 times faster than comparable tools, can capture customer-specific requirements and present individual solutions in the shortest of time. By utilizing this method, Heinrichs Messtechnik aims to keep the production costs of the sensor to an absolute minimum.

## 1001 Possibilities

The up-to-now world's smallest Coriolis Flow Meter with dual bent Coriolis technology offers various advantages, in particular where space is constricted e.g. in brownfield plants, mini plants, research reactors or in chemical injection applications.

## Variable Assembly Concept

For flexibility, different constructive variations of the HPC are available: Besides the traditional Inline Version, which can be inserted

directly into the process line, there are three further models available, suitable either for wall mounting, by means of wall brackets, or simply for placement on a table. "For our Table model there are two available options: either with the measuring tubes pointing downwards below the supply line or pointing upwards above the supply line. For the measurement of gas, upward pointing tubes are recommended to prevent any issues with fluid collecting in the tubes, and visa versa for the measurement of fluids".

Collectively, the devices are available in three measuring ranges:

0–20, 0–50 and 0–160kg/h. On request other adaptations are also available, for example, customer-specific enclosures, connectors or interfaces. In particular for the chemical and semiconductor industry, fully-welded stainless steel enclosures are also available upon request.

Furthermore, the technology is patent registered, and available with ATEX and IECEx approvals. Parallel to the launch of sales, Heinrichs Messtechnik is also working on a new miniaturized transmitter with flexible interfaces, specially designed for compatibility with the HPC.

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