Success Story

# Magnetic Suspension Balance: High-End Precision Balance for Measurements Even under Extreme Process Conditions

The magnetic suspension balance developed by Rubotherm enables any samples to be weighed under nearly any measuring conditions.


## Abstract

Rubotherm based in Bochum, Germany, developed a method for contact-free weighing of samples inside closed reactors. In the process, the suspension force of a sample is transmitted from a measuring chamber by a magnetic suspension coupling, which is patented worldwide, to a microbalance located outside the chamber under normal ambient conditions.


## Requirements

The magnetic suspension balance can be used for measurements where conventional gravimetric equipment fails. This magnetic suspension balance enables changes in the mass of samples to be measured accurately with high resolution under defined and controlled conditions (high pressure, extreme temperatures, corrosive gases and liquids, supercritical fluids, ionic liquids, etc.). In this manner, material transport quantities and variables of state can be determined exactly and directly. Such applications include sorption, diffusion, surface tension and density.

In addition, the magnetic suspension balance permits chemical reactions and manufacturing processes to be investigated and simulated, such as corrosion, decomposition, pyrolysis, polymerization, coating and drying.

With this magnetic suspension balance, measurements within the range of ultra-high vacuum of up to 700 bar and at temperatures ranging from -196°C to 1,550°C can be accomplished. Moreover, the balance in combination with automatic gas dosing and steam pressure controlling systems provides a turn-key system for process analytics. These systems permit reliable, fully automatic and highly accurate regulation of the composition, flow and pressure of the gas and | or steam that is fed into the reactor of the magnetic suspension balance.

The use of a weigh cell is crucial for designing and constructing a magnetic suspension balance. This is why Rubotherm has been relying for years on the weigh cells manufactured and supplied by Sartorius, a leading international provider of laboratory and process equipment and technology.

Key requirements on a weigh cell used in the magnetic suspension balance are high resolution in order to detect the slightest changes in the mass of a sample, optimal stability during weighing and outstanding repeatability. The electromagnet of the suspension balance is directly attached at the underfloor weighing hook of the balance, i.e., weigh cell.

## About the Customer

Founded in 1990, Rubotherm predominantly considers itself a manufacturer of specialty analytical balances, offering customized solutions in addition to its standard products. The company is headquartered in Bochum, Germany, and has a branch office in the USA. Along with a workforce of around 40 people, the company markets its products through various distributors all over the globe.

The magnetic suspension balance is successfully used in fundamental research work.

Rubotherm develops, produces and sells measuring equipment and laboratory plants for process engineering. The company primarily focuses on gravimetric measuring methods for recording changes in mass under controlled environmental conditions.

The weigh cell consists of two subassemblies: the electromagnetic force compensation weigh cell in a protective enclosure and the electronics mounted on a metal base plate in an optional module.

Magnetic suspension balances can measure changes in mass highly accurately.

## Solution

The new Sartorius weigh cell WZA215-LC is currently integrated into the magnetic suspension balance. Until now, the Rubotherm magnetic suspension balance had still used a Sartorius predecessor weigh cell model. Both the new weigh cell technology and the excellent long-term business relations with Sartorius enabled the latter's weigh cell expertise to be incorporated into Rubotherm's magnetic suspension balance.

The new model WZA215-LC is based on the sophisticated electronics of the Cubis® premium series of laboratory balances. This weigh cell is designed as a full-resolution sensor and has a readability of 10 µg throughout the entire weighing capacity range of 210 g, which ensures exceptionally accurate weighing results.

Moreover, this weigh cell is impervious to the effects of ambient conditions so it operates perfectly even in difficult environments. The short time it takes for the weigh cell to warm up ensures optimal workflows at all times as the electronics and the weigh cell components are separate from one another. To accommodate the electronics, Sartorius built a module specially designed to meet Rubotherm's requirements.

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