
tech-info

► ***DynFAS MW***

*Microwave density measurement*

*for determining dry substance content.*

*Brix value measurement*

*for sugar,*

*lime milk, and*

*molasses.*

BMA

# Microwave density measurement

***Microwave density measurement for determining dry substance content***

The determination of the dry substance content/Brix is extremely important for several steps of the sugar production process. This measurement has to be very accurate in order to determine, for example, the seeding time during the boiling and crystallisation process. Microwave measuring technology represents the optimal method to achieve this. In the past years, microwave measuring technology has established itself and proved to be reliable. The measured value is immediately available online and can be processed directly by a higher-level automation system.

***Fields of application***

The measuring system can be used to determine the dry substance content of any substance (dissolved or solid) in aqueous solutions, such as:

- Sugar solution (Brix)
- Milk of lime (Baumé)
- Molasses (dry substance content in %)

A measuring system comprises several components:

***Measuring probe***

The measuring probe combines the emitting and receiving aerials. The aerial rods are made of food-compatible polyether ether ketone (PEEK). The measuring probe is selected as appropriate for the place of installation. There are three basic types available:

***Pan probes with PT100***

For temperature monitoring and compensation

***Pan probes with flushing device***

This probe is equipped with two separate flushing channels, which keep the plastic rod free from incrustations, so that the microwaves can be brought into direct contact with the medium to be measured. The flushing parameters such as the interval and duration of flushing are matched to the product and the process.

***Pipe-installed probes made of stainless steel, with PTFE lining***

The type of probe is selected depending on the measuring task. Usually, pan probes without flushing device are used for batch-type crystallisation (batch-type vacuum pans), and flushed probes for continuous crystallisation. Pipe probes are installed for Baumé measurements in milk of lime and Brix measurements between the evaporator effects and at the last effect of the evaporation station.

*Sampling during the running process*

***Analysing unit***

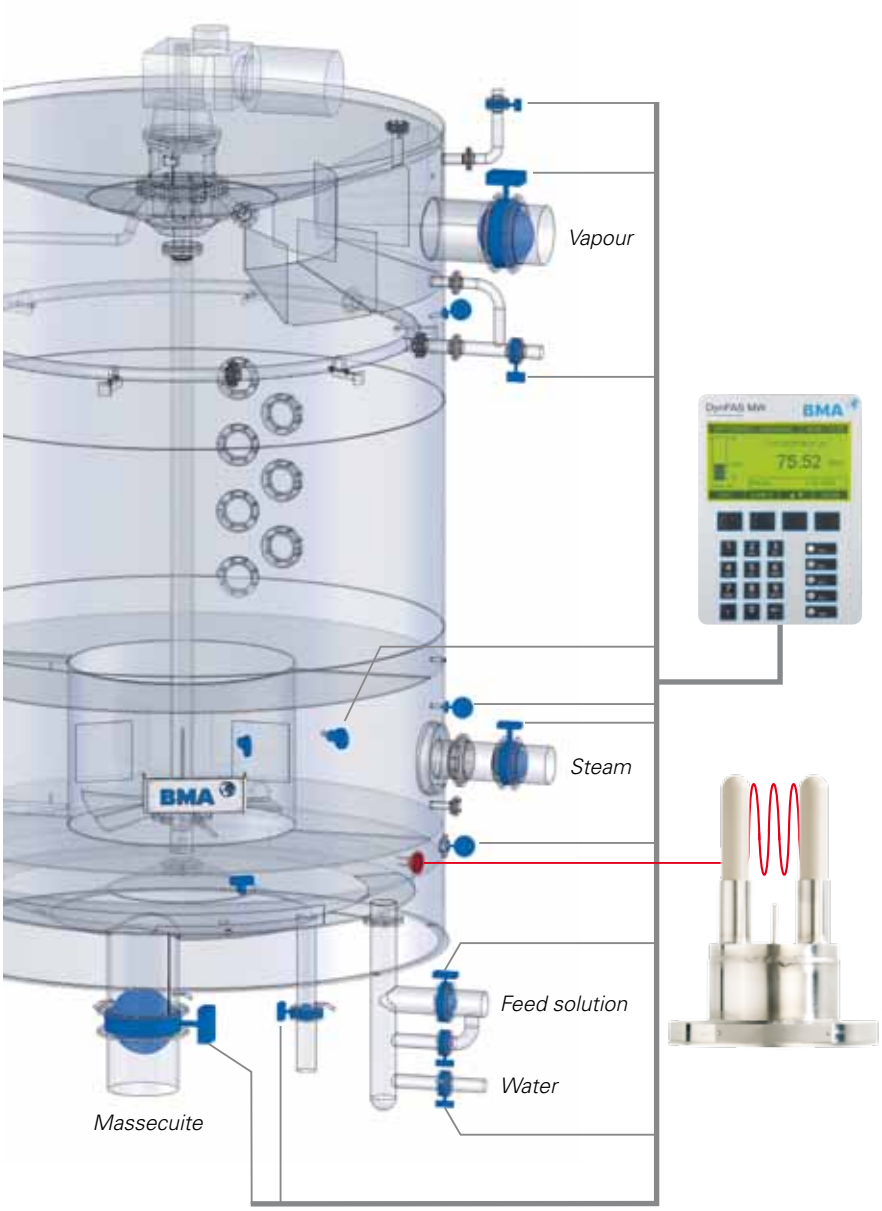
The analysing unit consists of microwave measuring components and a microcomputer, which manages the analysing process and the human-machine interaction. Two basic types of unit are available, which are distinguished only by the dynamics of the microwave measuring equipment. The analysing unit with high dynamics is used for analysing media with a low dry substance content and for applications where DN100 and DN150 pipeline probes are used.

The standard analysing unit (rated IP65) is operated with 90…265 V AC/45…65 Hz and provided with several inputs and outputs:

- PT100
- 2 analogue inputs
- 2 analogue outputs (0/4…20 mA)
- 3 digital inputs
- 2 relay outputs RS232/485

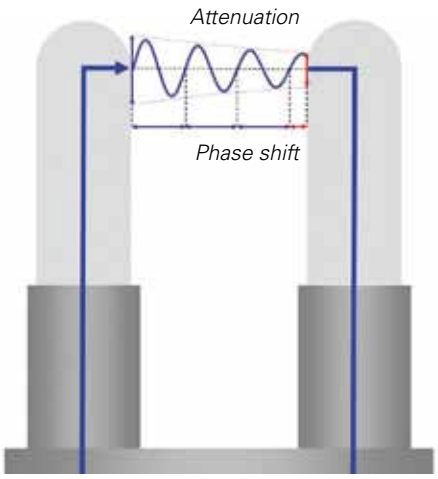
***Connecting cables (high frequency/HF cables)***

The cable set consists of four shielded HF cables and serves to transmit the microwaves between the probe and the analysing unit. Two of these HF cables are used as reference cables to compensate for environmental influences (for example, the ambient temperature).




*Typical installation on a vacuum pan with electrical, instrumentation & control components (highlighted in blue)*

# Application




*Damping (dB) and phase displacement (°/GHz)*

***Options***

A memory tool can be used for easy management of the calibration data stored in the unit. In this way the data can be simply read from and written back to the unit. The data can be processed on a PC using a free standard software application.

Where there is little room for installation, angle connectors can be used.

***Operation***

The measuring device offers multi-language operation via function keys and user-friendly menu guidance. To avoid operating errors, sensitive areas are password-protected. Sampling and calibration are performed directly on the device, without a personal computer or special programming knowledge being required. The samples analysed by the laboratory are manually entered directly at the analysing unit. An automatic calibration facilitates the calibration process. The measuring system is then ready for use.

*VKT from BMA for continuous crystallisation*

*Connection*

# Technical specifications

*Pan probe with temperature measuring unit*

*Pan probe with flushing device*

*Pipe-installed probe*

***Physical measuring principle***

The measuring principle utilises the specific physical properties of molecules. Owing to its atomic structure, each molecule has a more or less strongly developed electric polarity (dipole character). Unlike most other molecules (e.g., sucrose), the water molecule has very strongly developed dipolar properties. This difference is utilised and can be measured. Measuring, i.e. microwave transmission measuring is performed directly inside the product. The microwave is emitted from one aerial, penetrates the medium to be measured, and reaches the receiving aerial. A directional microwave field focuses the radiation and reduces interferences caused by the environment. The change in the intensity and the phase position of the microwave on its way through the medium is determined electronically. This change can be converted by calibration, so that the dry substance content of the medium to be measured is obtained as measured output value.

***Benefits***

- Reliable inline density measurement in real time
- Simple and automatic calibration directly on the device, no PC required
- 4 products that can be calibrated and are available at any time
- Precise measured value with excellent repeatability
- Can be easily integrated into existing automation systems
- BMA know-how and experience in the sugar production process

| ***Flange dimensions*** | ***Pan probe with temperature measuring unit*** | ***Pan probe with flushing device*** | ***Pipe-installed probe*** |
|---|---|---|---|
| DN 50 | | | PN 16 |
| DN 65 | PN 6 | PN 6 | PN 40 |
| DN 80 | PN 16 | PN 16 | PN 16 |
| DN 100 | PN 16 | PN 16 | PN 16 |
| DN 150 | PN 16 | PN 16 | PN 16 |
| ASA 2" | | | 150 PSI |
| ASA 2,5" | 150 PSI | 150 PSI | 300 PSI |
| ASA 3" | 150 PSI | | 150 PSI |
| ASA 4" | | | 150 PSI |
| ASA 6" | | | 150 PSI |

*Available probes*

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