

hydorpharm fbma

Inline moisture measurement system
for pharmaceutical applications



- *Independent of product density*
- *Suitable for pharmaceutical applications*
- *Insensitive to product deposits on the sensor*
- *Simple calibration in groups*
- *EX protection for all zones [option]*
- *Pressure-proof up to 11 bar [option]*

hydorpharm fmba

Features

The inline moisture measurement system *hydorpharm fmba* is an innovative system for use in fluidized-bed plants. Until now in the pharmaceutical industry, product moisture has chiefly been determined by the LOD method or by using Karl Fischer titration. However, discontinuous moisture measurement is not beneficial to the quality of products because the process has to be stopped and drying/granulation interrupted. The inline moisture measurement systems available so far could often not be used because the equipment deployed could only measure the skin moisture depending on the color and structure or they responded very sensitively to product residue on the sensor. The *hydorpharm fmba* inline measurement system revolutionizes moisture measurement in fluidized-bed plants.

It works by the 2-parameter microwave resonance method for determining damping and frequency shift and is based on a resonant electromagnetic oscillating circuit that excites the water molecules of powders and granulates in the vicinity of the sensor.

Evaluation of the signals permits a density, structure, and color-independent measurement of the skin and core moisture in real time with a sampling rate of more than 100 per second.

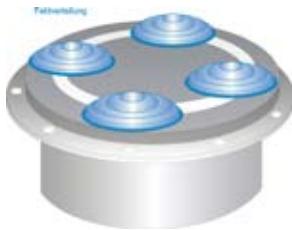
- Inline moisture measurement of powders and granulates in fluidized-bed systems
- Measurement of skin and core moisture
- Independent of density, structure, and color
- Insensitive to deposits on the sensor
- Simple calibration with long-term stability
- Similar products can be combined into groups
- GMP- and FDA-compliant design
- Available with explosion protection
- Available pressure-proof up to 11 bar
- Available for working temperatures up to 100°C



The 2PMR Measuring Method

The moisture sensor of the *hydorpharm fbma* contains a tuned electromagnetic oscillating circuit and therefore constitutes a resonant system.

Fig. 1: Electromagnetic flux lines on a stray-field sensor



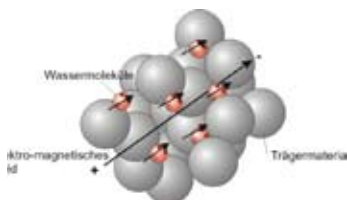
The measuring method is based on interactivity between the alternating electromagnetic field and the water molecules in the product. The water molecules in the product initially have random orientation.

Fig. 2: Water molecules are randomly oriented



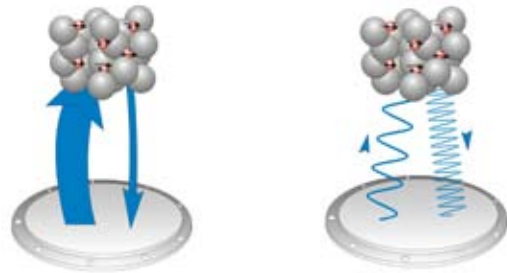
As a product with moisture content enters the alternating electromagnetic field of the measuring system, the water molecules are oriented toward the field (radio-frequency alternating field) because they behave like dipoles.

Fig. 3: Orientation of the water molecules



This transfers energy from the electromagnetic field to the product and reduces the propagation velocity of the electromagnetic wave.

Fig. 4: Energy transfer from field to the product Fig. 5: Reduction in propagation velocity



The system from which the excitation emanates therefore loses energy and the resonance frequency falls out of tune.

Fig. 6: Spectrum of resonances for various densities

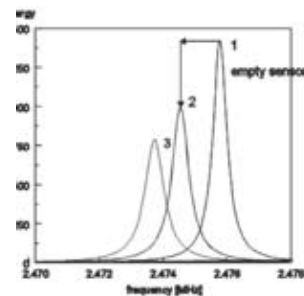
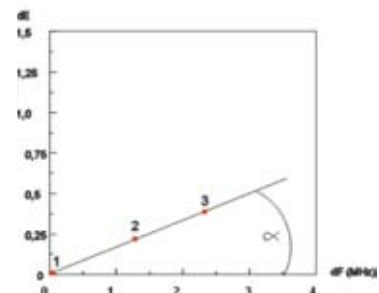


Fig. 7: Energy loss and frequency shift for various densities



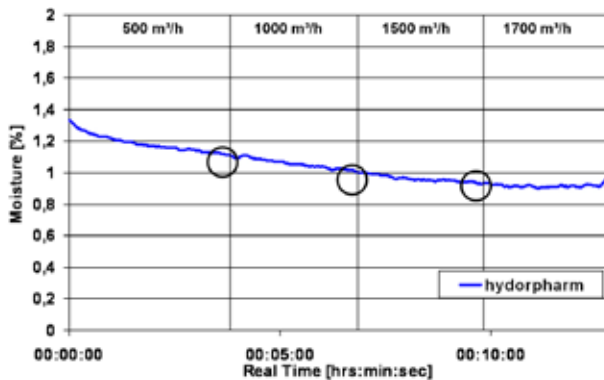
An analysis of the signals obtained results in angle α . The tangent of angle α correlates to the relative product moisture per unit of mass rF(%). Welle.

hydorpharm fbma

Results from Practical Use

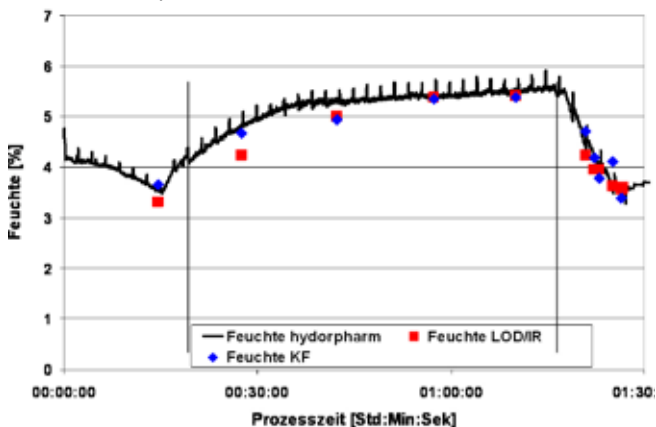
Because of the independence from the density of the particles/granulates and fluidized bed, reliable inline moisture measurement is no problem with the *hydorpharm fbma* even with varying flowrates.

Diagram 1: Density independence [Glatt CPG 15]



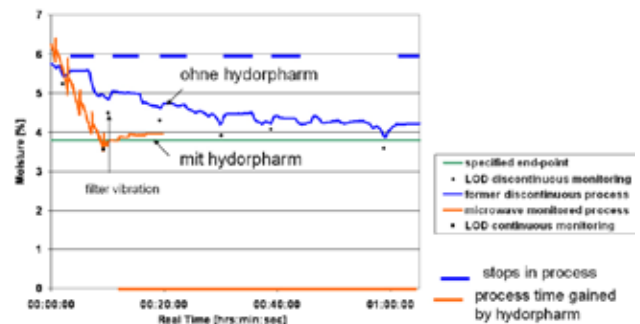
By comparison with the Karl Fischer titration and LOD/IR method, inline moisture measurement with the *hydorpharm fbma* shows the correlation between these 3 different methods.

Diagram 2: Granulation process of granulate that is free of water of crystallization



Inline monitoring of product moisture with the *hydorpharm fbma* can drastically reduce drying times.

Diagram 3: Drying verum granulate [Glatt WSG 60]



Advantages at a Glance

- Monitoring of product moisture in real time during the granulating and drying process
- Precise homing in on the target final moisture without interrupting the process
- Reproducible final moistures in changing climatic conditions
- Kind to the product due to uninterrupted process
- Detection of inhomogeneities during the granulation process
- Simple calibrations and combination into product groups
- Measurement data available in the intra-net via COM server [optional]
- 4-20 mA output signals for further processing in the plant control



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Ex Protection Variant



Dust, zone 20

Area in which there is constantly, over a long period, or frequently a potentially explosive atmosphere in the form of a cloud of combustible dust in the air.

Dust, zone 21

Area in which during normal operation there is occasionally a potentially explosive atmosphere in the form of a cloud of combustible dust in the air.

Dust, zone 22

Area in which during normal operation a potentially explosive atmosphere in the form of a cloud of combustible dust in the air either does not normally occur or only occurs for a short time. A short time usually means up to 2 hours.

Gas, zone 0

Area in which there is constantly, over a long period, or frequently a potentially explosive atmosphere as a mixture of air and combustible gases, vapors, or mist.

Gas, zone 1

Area in which during normal operation there is occasionally a potentially explosive atmosphere as a mixture of air and combustible gases, vapors, or mist.

Gas, zone 2

Area in which during normal operation a potentially explosive atmosphere as a mixture of air and combustible gases, vapors, or mist either does not normally occur or only occurs for a short time. A short time usually means up to 2 hours.

„ISensorControl“ Software

The “ISensorControl” device software permits operation (system settings, calibration, and visualization) of the microwave moisture measurement system *hydorpharm fbma*.

System configuration

Setting of

- Language [German, English]
- Communication interfaces
- Interfaces for standard signals 24 VDC, 4-20 mA
- Measurement parameters

Calibration

- Recording of measurement points
- Calculation and storage of calibrations

Measurement

- Performing null measurements/ hardware calibrations
- Measurement data administration/archiving intervals for moisture threshold values

Visualization and data export

- Graphical display of water content [%] and temperature [°C]
- Setting of display parameters
- Data export

Workstation

The workstation is used for operating the *hydorpharm fbma* inline moisture measurement system.

The connection uses CAT5 or shielded twisted pair [4 x 2 x 0.25mm²] cable via RS-422 interfaces in the workstation and connection box [max. distance 500 m].

As an option, it is possible to make a connection using the intranet via the LAN connection of the workstation and a COM server integrated into the connection box.

Unless otherwise agreed, the workstation of the *hydorpharm fbma* consists of a high-quality notebook with a generously dimensioned hard disk, a CD/DVD drive, USB 2.0 interfaces, and integrated network connection LAN [RJ45], and other modern features*.

The integrated LAN connection can be used for remote servicing. The workstation can optionally be equipped with an ISDN controller for remote servicing.

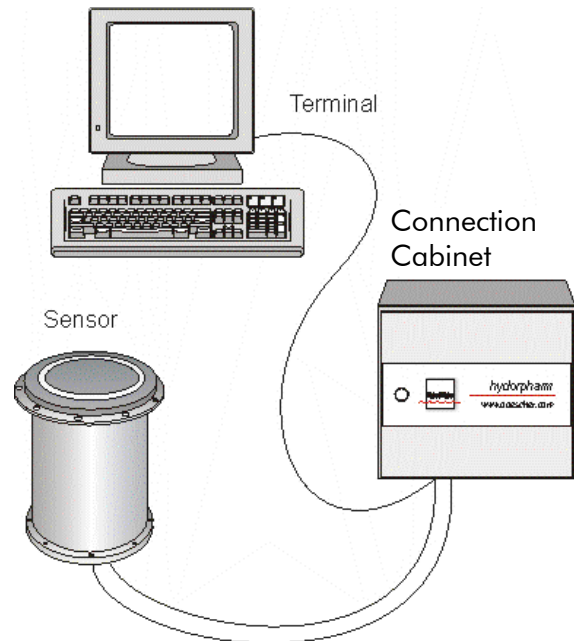
The operating system used is Windows XP.

The "ISensorControl" software is already installed and adapted to the measuring system supplied. A licensed version of the current remote server software is also installed*.

* You will find detailed information in our quotation.

Connection Options & Accessories

CAT 5 connection set
[connection cabinet – terminal]

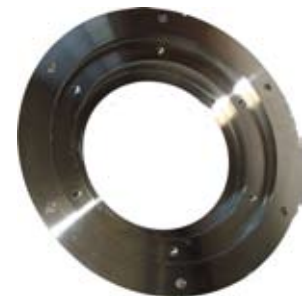


COM Server

Server for connecting the sensor to the terminal via the intranet.
[connection cabinet - terminal]

Adapter

Different adapters for use of the *hydorpharm* in fluidized-bed plants of different manufacturers.



Technical Information



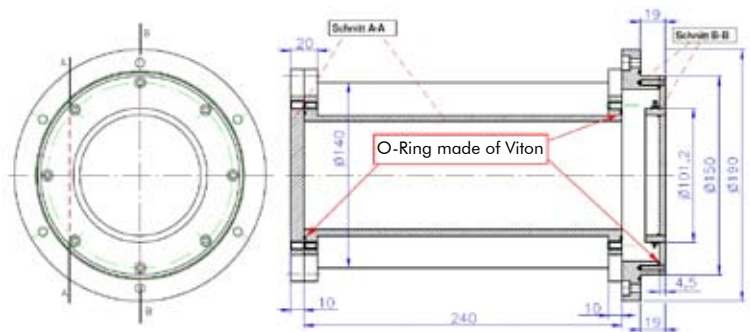
Measurement method

2-parameter microwave resonance technology for determining evaporation and frequency shift.

Sensor

- Microprocessor-controlled electronics
- Microwave generator [2.5 GHz, $P < 20$ mW]
- Wide-range power supply 24 VDC [19-36VDC]
- I/O interface module "SPS 4.20" [analog & digital inputs and outputs, 4-20 mA, 24 VDC]
- RS422 interface or optionally COM server
- Stray-field resonator made of ceramics
- Product-contacting the sensor surface made of stainless steel and ceramics. Housing made of stainless steel 1.4301 and 1.4404.
- Degree of protection IP65
- Length: 283 mm, weight 5 kg
- Flange outer dimension: 190 mm
Flange fit dimension: 150mm
- 6-hole fixture M6

Illustration: hydorpharm fbma, ATEX Zone 20



Connection cabinet

- Housing for hygienic areas and corrosive environments
- Material 1.4301, ground surface, grain 240
- Housing with covered hinge and seal with screw-on webs for mounting rails
- Dimensions [HxWxD]:
250 mm x 200 mm x 160mm

For further information please contact:

Tel.: +49 (0)40/879 76770

www.hydorpharm.com