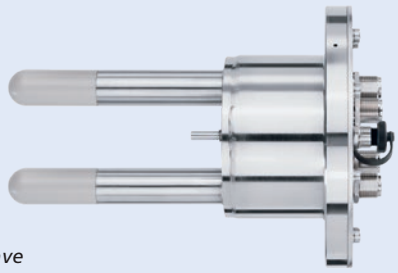
MICROWAVE TECHNOLOGY

MicroPolar Brix LB 565

Brix and Concentration Measurement with Microwaves

BERTHOLD TECHNOLOGIES

MicroPolar Brix LB 565



Microwave Container Probe

Microwave FlowCell

Transmitter

An important parameter in sugar production is the concentration of sugar juice. The determination of the dry substance content is absolutely essential for optimum process control and to optimize and improve the quality of the sugar. Berthold Technologies has been involved in process measuring technology for sugar production for many years and therefore knows and understands the requirements of such measuring systems very precisely. The MicroPolar Brix determines online, reliably and precisely the concentration of sugar juice during the entire process.

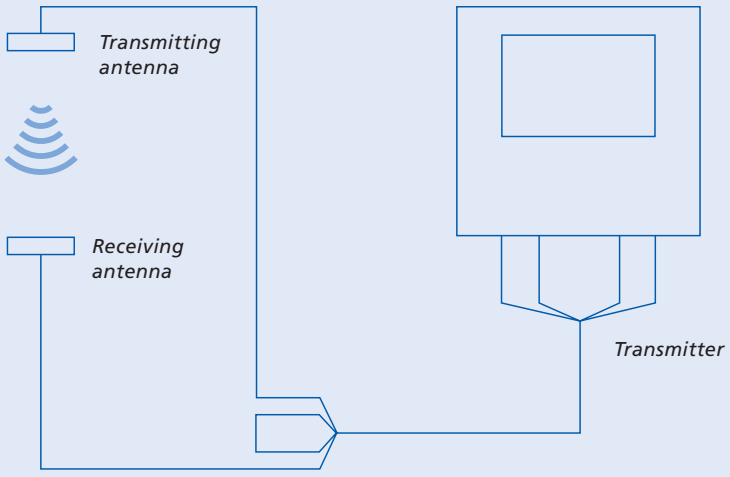
Your benefits

- Installation options in both container and pipeline using two different measuring probe versions
- Quick installation by laying only one probe connection cable
- Easy commissioning through pre-calibration, automatic calibration with reference calibration, easy sample recording
- Simple operation through graphic display and via alphanumeric keyboard
- Accurate and reliable measurement using two highly stable PLL synthesizers, sweeping signal generation over several frequency points, device and cable drift compensation using a reference channel
- High operation reliability due to accurate and live dry substance display over the entire process, separate measurement evaluation per measuring point, pause recognition between two crystallization processes
- Expertise from more than 40 years of experience in the sugar industry, with well over 1000 systems sold worldwide
- Approvals: EHEDG, EG 1935/2004, FDA approved materials

Microwave Measuring Principle

Microwaves irradiate the product to be measured, whereby the free water molecules are set in rotation. This rotation causes a deceleration (phase shift) and a weakening (attenuation) of the irradiated microwaves.

As a measure of the concentration, Micro-Polar Brix captures these two measurement effects, compensating for the influence of the product type and purity of the sugar solution. The multi-frequency technique used by Berthold Technologies ensures a very stable and representative measurement, which is not influenced by disturbing reflections or resonances. The integrated reference line ensures reliable compensation of environmental influences.



Microwave Container Probe

The container probe is attached to the mounting flange of the crystallizer or integrated into the existing pipeline. The probe is connected to the evaluation unit via a high-frequency cable Quad, up to a distance of 10 m. The reference line built into this cable allows for very accurate device and cable drift compensation. The pre-calibrated MicroPolar Brix issues very accurate measured values after simple start-up and automatic reference adjustment. The final calibration is carried out automatically with graphical result display after device-assisted recording of the sample.

The container probe consists of two antennas with removable PEEK caps. It is available in two versions. The version without flushing is suitable for use in discontinuous or batch processes, the version with flushing device is ideal for continuous crystallizers.

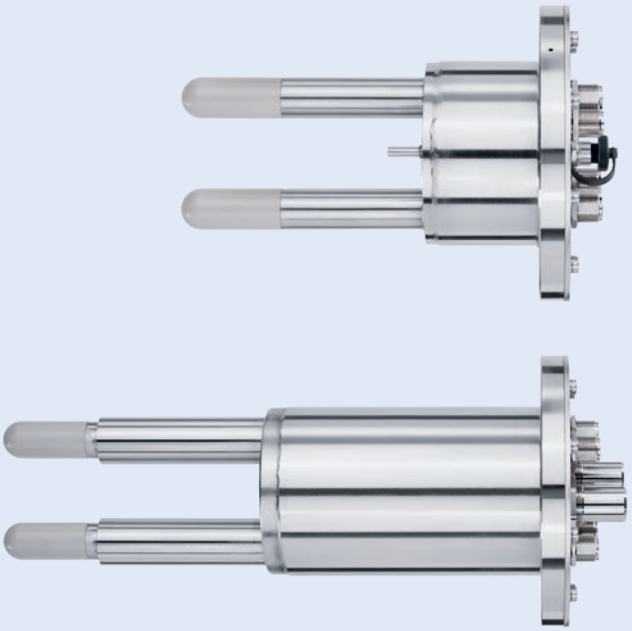
General Characteristics

- For installation on containers or pipelines
- Available with or without flushing function
- For use in continuous and discontinuous crystallizers
- Standard flange connections
- Robust, exchangeable plastic caps
- Integrated reference line for undisturbed measurement
- Integrated Pt100 for temperature compensation in the version without flushing device

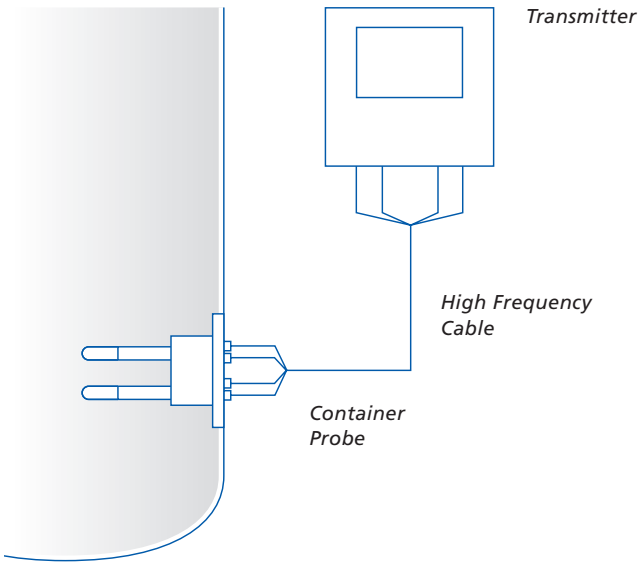
Container Probe with flushing

To counteract the crusting of the probes in the continuous crystallization process, the probes can be flushed cyclically during the running process.

- Integrated flushing device
- Allows flushing the probes in the running process
- Quick recovery of the measuring signal after flushing within just a few seconds



- **Interchangeable plastic caps with internal thread for easy replacement**
- **Removal aid: Using two large eyebolts on the front of the probe, it can be easily disassembled**
- **Available with integrated flushing device**
- **FDA-approved materials**



Technical specifications

Material	Plastic caps made from PEEK, stainless steel PT100 connection cable: Silicon / Teflon
Process coupling	Flange according to DIN EN 1092 type 05 DN65 / PN6, DN 80, 100, 150 / PN16; ASA flange 2.5" / 150 PSI (More on request)
Connections	4 x HF connections: N female, 50 Ω for HF cable with max. 10 m length
Design	integrated reference path
Variants	without flushing: with Pt100 with flushing: 2 x G3/8" female thread (DIN ISO 228-1)
Temperature range	Product temperature: 10 ... 120 °C (283...393 K) Ambient temperature: –20 ... 60 °C (253...333 K) Storage temperature: 10 ... 80 °C (283...353 K)
Process pressure	Up to 16 bar, depending on model

Microwave FlowCell

The FlowCell is integrated into an existing pipeline to measure the moisture content. The probe is connected to the transmitter via a high-frequency quad cable up to a distance of 10 m. The reference line built into this cable allows for very accurate system and cable drift compensation. The final calibration is completed automatically with graphical result display after device supported recording of the sample.

The FlowCell consists of a standard globe housing made of stainless steel 1.4404 and two antennas, which can be easily mounted via clamp connection and, if necessary, also be replaced. Sealing takes place by means of O-rings made of EPDM and two PEEK windows.

Characteristics

CERTIFIED EHEDG EUROPEAN HYGIENIC ENGINEERING & DESIGN GROUP
TYPE EL
CLASS I

- Online moisture measurement
- Hygienic design
- For installation in pipelines
- Stainless steel inline housing
- Nominal sizes from DN 50 to DN 150
- Common connection variants
- Replaceable antennas

Accessories

In some applications, for example conductivity and/or temperature compensation may be required. In this case, Berthold offers the following options as accessories for installation in a second globe housing:

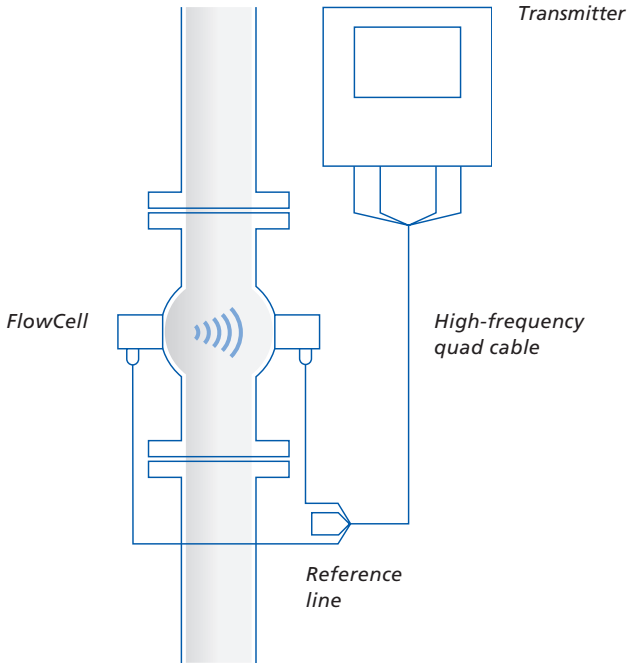
- Temperature sensor
- Conductivity sensor
- Sampling valve

- Microwave measurement covers the entire pipe cross-section
- Interchangeable antennas
- EHEDG certification*
- Suitable for contact with food according to the regulation (EC) No 1935/2004
- FDA-approved materials
- CIP-/SIP-capable (cleanable and sterilisable)
- Virtually pocket-free

Technical specifications

Material housing	stainless steel 1.4404 polished (AISI 316L)
Material antenna cover	PEEK
Sealing materials	EPDM
Process connection	Standard welding flange acc. to EN 1092-1/11 Hygiene: Thread/collar with nut according to DIN 11853-1 weld stubs
Nominal pipe sizes	DN 50 to DN 150
Nominal pressure level	PN 16
Temperature range	Product temperature: 10 ... 130 °C, temporarily up to 140 °C Ambient temperature (operation and storage): –20 ... 60 °C
Connections	2 x HF connections, max. cable length: 10 m
Certificates, Regulations	EHEDG, EC 1935/2004 (hygienic variant)

*valid for hygienic and aspeptic process couplings



Transmitter

Direct data entry

Automatic
On-Site Calibration

Robust stainless steel housing

Easy sampling

Different user levels

Integrated plausibility check

Multi-frequency technology

High systems dynamics

The heart of the measuring system is the transmitter. It is the result of many years of experience and know-how. The transmitter is available in two different versions, each with an individual dynamic range.

Depending on the application or measuring range and the requirements, the ideal technology will be applied. Four different products can be calibrated. The calibration is performed directly on the transmitter. The software includes a sampling function where lab values can be conveniently and easily entered and assigned to readings. The optimal calibration curve is determined automatically.

LB 565

Transmitter	
Operating frequency	2,4 – 2,5 GHz (ISM-Band), depending on local regulations
Transmission power	MicroPolar Brix: <0,1 mW (< –10 dBm) MicroPolar Brix ++: <10 mW (<10 dBm)
Housing	Wall housing made of stainless steel MicroPolar Brix: HxWxD: 300 x 323 x 140 mm MicroPolar Brix++: HxWxD: 400 x 338 x 170 mm
Protection type	IP65
Weight	MicroPolar Brix: about 6.5 kg MicroPolar Brix ++: about 8.0 kg
Ambient conditions during operation	–20 ... +60 °C (253...3 33 K), no condensation Relative humidity: max. 80 % Altitude: max. 2000 m
Ambient conditions during storage	–20 ... +70 °C (253 K ... 343 K), no condensation Relative humidity: max. 80 %
Achievable accuracy	≤ 0.2 weight % (standard deviation) depending on product and sensor
Display	Dot matrix LC display, 114 mm x 64 mm, 240 x 128 pixels, with back-lighting, automatic contrast setting
Keyboard	Freely accessible foil keypad, light-stable and weatherproof: alphanumeric keyboard and 4 softkeys (software-assigned buttons)
Power supply	For MicroPolar Brix, depending on device type: 1.) 100 ... 240 V AC, 45 ... 65 Hz 2.) 24 V DC: 18 ... 36 V; 24 V AC: –20%, +5%, 40 ... 440 Hz For MicroPolar Brix ++, depending on device type: 1.) 100 ... 240 V AC, 45 ... 65 Hz 2.) 24 V DC: 18 ... 36 V, no reverse polarity protection
Power consumption	For MicroPolar Brix:max. 30 VA (AC/DC), depending on configuration For MicroPolar Brix ++: max. (48/60) VA (AC/DC), depending on configuration
Fuses	For MicroPolar Brix: 2 x 2.0 A / slow-blow For MicroPolar Brix ++: 2 x 2.0 A / slow-blow at 100 ... 240 V AC or 2 x 6.3 A / slow-blow at 24 V DC
Battery type	3 V Lithium button cell, type CR2032
Measured value	e.g. concentration, dry content

Inputs and outputs	
Cable cross-section	min. 1.0 mm² (mains supply)
Cable feed-through	2 x M20x1.5 for cable 5...14 mm (depending on application) 4 x M16x1.5 for cable 5 ...8 mm (depending on application)
Sensor connection	Inputs and outputs for signal and reference channel, 50 Ω N-socket
HF cable	Cable lengths: 2, 4, 6 and 10 m; 50 Ω; both sides with 4 N connectors
Current input	2 x current input 0/4 ...20 mA, ohmic resistance 50 Ω, 1x insulated, 1x instrument ground e.g. for temperature compensation
Current output	Current output 1: 4...20 mA, ohmic resistance max. 800 Ω, insulated Current output 2: 0/4...20 mA, ohmic resistance max. 800 Ω, insulated e.g. for result or temperature output
PT100 connection	Measuring range: –50 ... +200 °C (223 ... 473 K); measurement tolerance: < 0.4 °C
Digital input	3 x digital input
Relay outputs	2 x relays (SPDT), insulated
Serial interfaces	RS232 on the bottom side RS485 via terminal strip Data format: 38400 Bd, no handshake, 8 data bits, 1 stop bit, no parity

Brix-Measurements

Measuring Brix in an Evaporator

Customer Benefits

- Safe and reliable control of the evaporation process
- High throughput
- Optimum energy usage
- Optimized thickening of the syrup

Characteristics

- Located at the inlet or outlet of the evaporator
- The microwave FlowCell is ntegrated into the pipeline
- Continuous online concentration measurement
- Representative results by the most advanced microwave transmission measurement
- Pre-calibrated system
- Maintenance free probe and evaluation unit

Measuring Brix in the Crystallizer

Customer Benefits

- Very precise and reproducible determination of the seeding point
- Uniform sugar crystals and improved quality
- Reliable control throughout the whole crystallization process
- Continuous production without process downtime

Characteristics

- The container probe is installed in the container wall in the crystallizers, chambers or in the discharge line
- High measurement resolution due to focused measurement signal
- Integrated temperature sensor for batch processes
- Pre-calibrated system
- Robust sensor elements with integrated probe flushing for continuous use in continuous crystallizers
- Maintenance-free system

Further applications in the sugar industry

Density Measurement of milk of lime in the cleaning process

Customer Benefits

- Online density measurement
- Precise and representative real-time data for improved process control
- Optimized cleaning results
- Cost-effective use of limestone

Characteristics

- State-of-the-art microwave measurement technology
- No maintenance necessary
- Very accurate and reproducible measurement
- Installation either in pipelines or in vessels

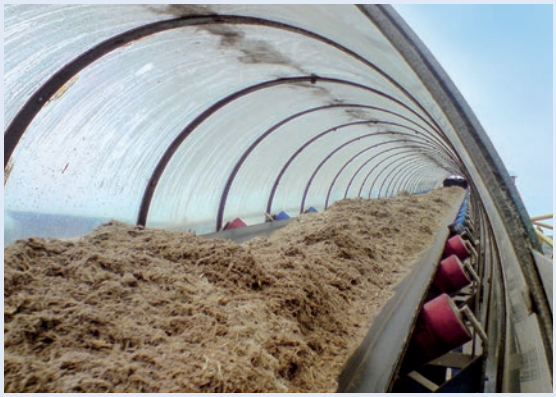
Measurement of moisture in sugar beet and bagasse and in sugar cube production

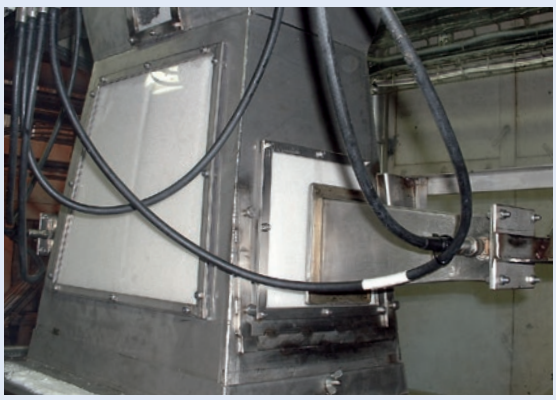
Customer Benefits

- Exact determination of the dry matter content or moisture content
- Determination of the moisture over the entire material cross section, not only on the surface
- Accurate and representative real-time data
- Consistent with product quality requirements and customer contracts

Characteristics

- Non-contact and non-invasive measurement method
- State-of-the-art microwave technology
- Online determination of the dry matter content
- Highly representative transmission measurement – the entire material cross section is measured
- Minimum wear and tear, therefore low maintenance measurement





We are there for you! Worldwide.

Our sales engineers look forward to receiving your request. Regardless of what you want to measure or where the measurement is taking place, we will equip you with the right system for each measurement and we know how to configure it so that it is perfectly suits your needs. From a wide variety of possible options, our application engineers will choose the right one for you.

With almost 70 years of experience, a team of 350 employees worldwide and product innovations that set new standards in technology, we see ourselves, like no other, as experts in radiometric measurement solutions.

All products are developed and manufactured in Germany. At Berthold you always get quality „made in Germany“.

Berthold Technologies' perfect solutions from one single source.

Berthold's experienced team engineers and service technicians are always there when you need them. Our global network of offices ensures fast and above all very competent assistance in case of need. No matter where your production site is located, our qualified personnel will be with you in no time at all.

You can take our word for it

LB 565 × 07-2018 × 500 × Id.-Nr. 39531PR2 Rev. 05

BERTHOLD TECHNOLOGIES

Berthold Technologies GmbH & Co. KG · Calmbacher Straße 22 · 75323 Bad Wildbad, Germany
Telefon +49 7081 177-0 · Telefax +49 7081 177-100 · industry@berthold.com · www.berthold.com