

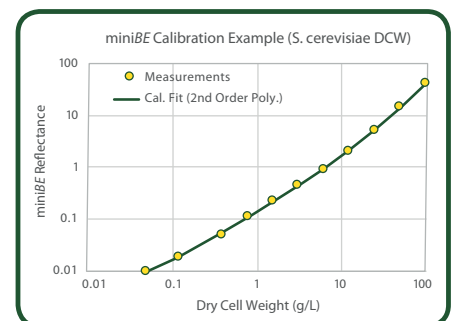
- Optimized to monitor cell density in small vessels and single use fermenters
- Automated, continuous, real-time multi-vessel biomass OD monitoring
- Noninvasive: measures through vessel wall, no sampling, no port required
- Diverse vessel compatibility with working volumes down to 10 ml
- Unique and highly effective patented bubble correction
- Ultra-wide biomass range: < 0.3 to > 300 OD units
- Built-in predefined biomass calibrations

Noninvasive Multiplexed Biomass Monitor

The miniBE Multiplexed Biomass Sensor System is optimized for parallel multi-vessel cell density monitoring in small vessels and single use fermenters in a space saving format. Simply attach a small miniBE Universal Vessel Adapter onto the vessel wall, then click-in the reusable and detachable fiber optic sensor with a simple push. The vessel adapter accommodates a wide array of vessel types with no immersion port required.

Ultra-wide Biomass Range

Monitoring cell biomass from inoculation to harvest frequently requires at least 3 orders of magnitude of total cell biomass sensitivity. The miniBE sensor is able to measure biomass over a very wide range of growth from < 0.1 to > 100 g/L dry cell weight, without dilution, without sampling, with one single sensor. The graph shows a typical calibration curve for a miniBE sensor to dry cell weight for yeast.

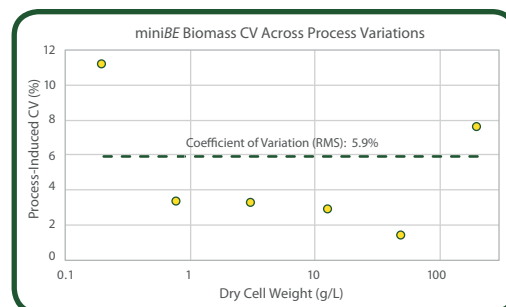


Real-time Online Monitoring

The miniBE Biomass Sensor System consists of up to 4 sensors connected to a multiplex base unit which interface with the included software, allowing the ability to track fermentation progress in real time. The system comes with predefined biomass calibrations and additionally, the software can calibrate the sensor output to desired cell type and/or off-line measurement units (OD, g/L dry cell weight, cells/ml, NTU, etc.). The base unit comes with USB and 4-20 mA analog output enabling process connectivity with 3rd party controllers.

Highly Effective Bubble Correction

The miniBE sensor employs a patented bubble compensation algorithm that is effective over 3 orders of biomass magnitude, under widely varying process conditions. The graph shows the process-induced variation in yeast dry cell weight prediction across conditions spanning the full range of typical aerobic fermentation conditions (200 mL vessel, agitation: 750-2000 rpm, sparge: 0-2 vvm).



How It Works

The miniBE measures back-scattering reflectance at a wavelength of 1330 nm, where optical penetration into the medium is < 3 cm and the optically sampled volume is < 4 ml. This measurement volume is small enough so that measurements can be made in small vessels while at the same time maintaining a very wide linear range of sensitivity to biomass. Using an infrared laser source also avoids light absorbance by colored media components, colored vessels, and visible-light absorbing chromophores such as photosynthetic algae.

miniBE Sensor Specifications

SENSOR (PERFORMANCE)	
Range of Biomass Sensitivity	< 0.1 to > 100 g/L DCW
Biomass Accuracy (determined for dry cell weight of <i>S. cerevisiae</i> during exponential growth phase)	15% biomass 0.1 to 100 g/L DCW
Performance Verification	Reflectance Standards, high and low
Averaging Time Window (trimmed mean)	2 sec – 8 min
SENSOR AND UNIVERSAL VESSEL ADAPTOR (PHYSICAL)	
Universal Vessel Adaptor	24 mm x 21 mm x 10 mm (H x W x D)
Active Optical Window	6 mm x 2 mm
Minimum Cable Clearance	65 mm (vessel wall to cable bend)
Cable Length	2 m (6 ft) (customizable)
SENSOR (ENVIRONMENTAL AND SAFETY)	
Operating Temperature	5 to 70 °C (40 to 160 °F)
Laser Product Classification	Class 1