



Level



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# Brix Concentration Measurement

Promass 83 is used for Brix measurement in sugar, fruit, and juice industries



Fresh oranges to fresh juice



Promass 83 F



Typical juice storage

## Product information

The measurement of degrees Brix is required in multiple industries as a means to grade product concentration, quality, or in blending operations. The Brix scale can vary by industry, either by scale or reference temperature. Coriolis mass flow meters are being used in process applications to measure degrees Brix as it correlates to density.

## Customer profile

Degrees Brix has been used as a measurement of the percent dissolved sucrose in the food industry for years. A ten percent degrees Brix would equal ten grams of sucrose dissolved in 100 grams of water.

Typical handheld, bench and in-line refractometers or hydrometers are often employed in the food industry to produce a measurement of dissolved sugar Brix to determine product quality or grade.

Refractometers measure dissolved sucrose only and do not take into account the amount of insoluble solids, minerals, pulp or sugars present in solution when producing a measurement. This can lead to a disagreement between the measurement produced by a Coriolis mass flow meter and that produced by a refractometer.

## Application description

Several degrees Brix measurement scales exist in the food industry.

The ICUMSA (International Committee for the Uniform Measurement of Sucrose Analysis) produces a table used to gauge cane and beet sugar solution concentration. This table is referenced from 10 to 80 degrees C.

The Orange Juice Industry must conform to USDA requirements. They have specified ranges of Brix which relate to Single Strength Equivalent (SSE) or concentrated juice which differs from the ICUMSA table. The measurement scale for Orange juice varies from 8.5 to 70 degrees Brix. Further, the product is graded by a Brix to Acid ratio and is usually corrected to 20 degrees C.

The Tomato Industry uses multiple tables published by the NFPA for "sugar scale" or refract index for grading juice, paste, ketchup, and pulp products correlated at 25 degrees C. The tomato tables also differ from the ICUMSA table used for cane and beet sugar.

## Application challenges

Brix or sugar scale measurement must always be referenced to the proper table and temperature.

Since a Coriolis meter measures actual density, the measurement of degrees Brix or sugar content can be fouled by:

- measurements performed to the wrong reference temperature or scale, not taking into account the effects of total soluble solids (TSS) and insoluble solids (pulp, minerals and undissolved sugars), or failure to use the proper expansion coefficient for correction of the measurement to a different reference temperature.

## Instrument used

PROline Promass 83F with custom concentration function.

## Previous instrument

Refractory, densitometer, hydrometer or competitor Coriolis mass flow meter.

### Measurement results

The Endress+Hauser Promass Coriolis mass flow meter has been used in multiple food industry applications for the measurement of degrees Brix.

The Coriolis measurement results are accurate to 0.0005 grams/cc or +/- 0.05 sugar scale with a high degree of repeatability.

Since the Coriolis meter is a multi-variable meter, it can produce simultaneous measurement of mass or volume flow, custom density, and temperature all in one unit.

### Instrument description

PROline Promass 83F is a dual tube Coriolis mass flow meter with exceptional accuracy and suitable for hygienic applications. The meter can be provided with Tri-clamp fittings and is 3A approved. Special polish options are available.

### Measuring principle

Coriolis meters produce a measurement of mass flow based on the Coriolis effect. An independent measurement of product density is calculated from the resonant frequency of the sensor tube vibration.

A standard table for degrees Brix to the ICUMSA scale is included. Custom concentration function allows any industry table to be loaded or a customer specific table to be used. Customers can program square and/or linear expansion coefficients compensation, correlation of multiple densities at different temperatures, incorporation of either a 2-D or 3-Dimensional polynomial function.

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