

## Near Infrared Spectroscopy



DA 7250 AT-LINE NIR ANALYZER

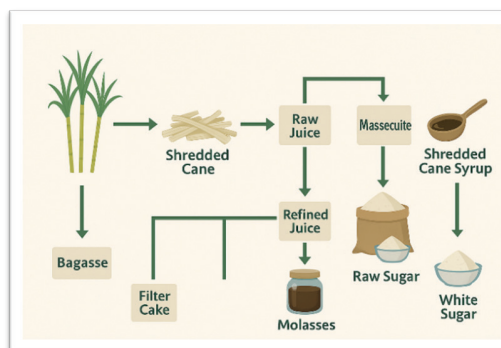
## DA 7250 Sugar Cane Package

Sugarcane is a tall, robust grass that is grown in over 100 countries where the climate is primarily tropical. The plants could be between 2-6 m and are fibrous and rich in sucrose. Sugarcane is used for sugar production and represents about 86% of global production, with the rest coming from sugar beet. Approximately 75% of the global sugar cane consumption is in the food manufacturing industry. Another big industry is biofuel production.

Sugarcane is typically harvested 1–2 years after planting. Canes are crushed to extract sucrose-rich juice, which is processed into raw or refined (white) sugar. Rapid processing is essential to prevent sucrose deterioration.

Byproducts and co-products include Molasses (for alcohol industries) and Bagasse (fibrous residue used for bioenergy or industrial feedstock).

These make sugarcane an important crop for renewable energy and circular processing systems. The picture shows how a sugar cane process could look from the raw material to the end products.



The key quality parameters in the sugar industry are polarity, moisture, fiber, and pH.

**Polarity** measures the sucrose purity, which is a key factor for the pricing, yield and process efficiency. **Moisture** content is important to measure storage purposes, extraction and energy used. **Fiber** (Non-sucrose solids) are important to optimize milling performance. The **pH** (acidity/alkalinity) is important since it prevents sucrose losses, controls color, ensures smooth processing of juice or syrup.

The DA series of analyzers are diode array NIR instruments from Perten, designed specifically for analysis in the food and agricultural industries. The DA series includes both benchtop and process analyzers and combines outstanding analytical accuracy with speed, ease of use, ruggedness, and versatility. The instruments can be used extensively in the sugar processing industry to check the raw material, but also to control the overall process and final product. This Package includes calibrations for sugar industry from raw material to final product and can be used in any DA instrument. Calibrations are based on advanced algorithms such as Partial Least Squares (PLS), Artificial Neural Network (ANN), and PerkinElmer's Honigs Regression™ (HR) product.

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| Product               | Parameter      | Unit    | Samples | R    | Range         |
|-----------------------|----------------|---------|---------|------|---------------|
| <b>Bagasse</b>        |                |         |         |      |               |
| Large sample cup      | Polarity       | %       | 1200+   | 0.98 | 0.8 - 10.8    |
|                       | Moisture       | %       | 1200+   | 0.98 | 40.6 - 82.4   |
| <b>Filter cake</b>    |                |         |         |      |               |
| Large sample cup      | Polarity       | %       | 600+    | 0.88 | 0.1 - 6.8     |
|                       | Moisture       | %       | 800+    | 0.74 | 54.1 - 88.0   |
| <b>Juice, Raw</b>     |                |         |         |      |               |
| Disposable cup        | Brix           | %       | 1400+   | 0.92 | 12.0 - 24.2   |
|                       | Polarity       | %       | 1400+   | 0.93 | 7.6 - 20.1    |
|                       | pH             |         | 500+    | 0.96 | 4.8 - 8.1     |
| <b>Juice, Refined</b> |                |         |         |      |               |
| Disposable cup        | Brix           | %       | 100+    | 0.89 | 54.5 - 64.4   |
|                       | Polarity       | %       | 100+    | 0.89 | 62.1 - 76.6   |
|                       | pH             |         | 500+    | 0.96 | 4.8 - 8.1     |
| <b>Massecuite</b>     |                |         |         |      |               |
| Disposable cup        | Brix           | degrees | 600+    | 0.90 | 84.7 - 95.4   |
|                       | Polarity       | %       | 600+    | 0.98 | 63.7 - 89.5   |
| <b>Molasses</b>       |                |         |         |      |               |
| Disposable cup        | Brix           | degrees | 1000+   | 0.96 | 50.8 - 91.8   |
|                       | Polarity       | %       | 900+    | 0.96 | 11.9 - 64.2   |
|                       | Reducing sugar | %       | <100    | 0.87 | 18.2 - 21.1   |
| <b>Raw sugar</b>      |                |         |         |      |               |
| Large sample cup      | Moisture       | %       | 2100+   | 0.84 | 0.0 - 1.0     |
|                       | Polarity       | %       | 2200+   | 0.82 | 96.0 - 99.8   |
| <b>Shredded cane</b>  |                |         |         |      |               |
| Large sample cup      | Brix           | degrees | 2700+   | 0.94 | 6.6 - 26.7    |
|                       | Polarity       | %       | 2700+   | 0.95 | 5.2 - 23.1    |
|                       | Fiber          | %       | 2000+   | 0.45 | 9.1 - 18.9    |
| <b>Syrup</b>          |                |         |         |      |               |
| Transflectance cup    | Brix           | degrees | 2800+   | 0.98 | 49.8 - 75.6   |
|                       | pH             | N/A     | 2800+   | 0.93 | 5.2 - 9.2     |
|                       | Polarity       | %       | 2800+   | 0.94 | 44.8 - 73.0   |
| <b>White sugar</b>    |                |         |         |      |               |
| Large sample cup      | Ash            | %       | 100+    | 0.89 | 0.004 - 0.034 |
|                       | Moisture       | %       | 100+    | 0.56 | 0.02 - 0.04   |
|                       | Polarity       | %       | 100+    | 0.92 | 99.9 - 100.0  |

NIR is an indirect method, and the actual accuracy will depend on the accuracy of the reference method which is used for comparison. For most products and parameters, a typical accuracy would be 1-1.5 times the accuracy of the reference method.

PerkinElmer recommends that you validate calibration models on a regular basis or whenever there are changes in sample variation or process environment, in accordance with ISO 12099 guidelines for application of Near Infrared Spectroscopy.

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