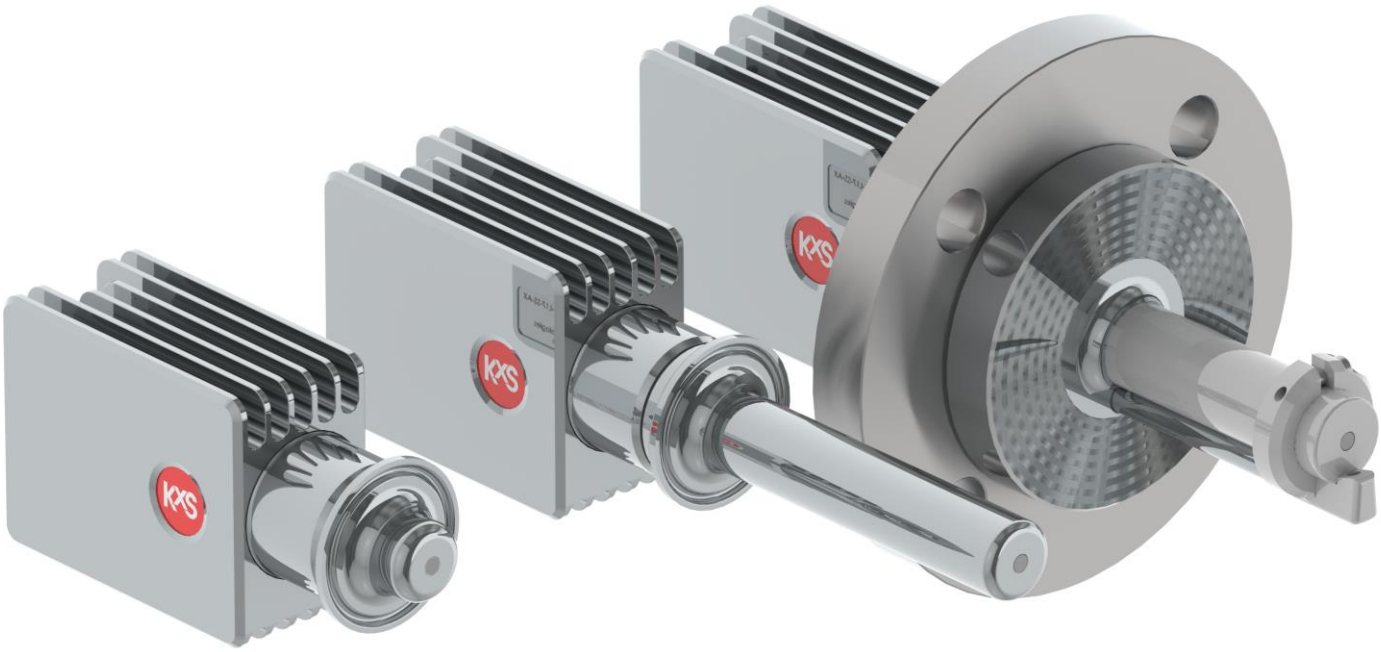
Excellence in refractive index measurement



KxS Inline Brix refractometer DCM-20 for sugar process control

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Technology that is built on over 40 years of industry-leading experience

KxS Inline Brix refractometers are used throughout the entire sugar production process. Whether the source is sugar cane or sugar beet, our inline refractometers monitor Brix from initial processing and refinement to syrups, and final liquid and crystallized products.

The DCM-20 consists of a hygienic compact, or industrial probe sensor and it comes with flange or Sanitary process connections and flow cells for easy installation in process pipes and crystallizers.

The DCM refractometer provides a full measurement range of 0-100 Brix, utilizing two independent 4-20mA outputs and a digital Modbus TCP output for connectivity to automatic process control systems.

For enhanced functionality, an optional HMI unit offers a local display and interface, ensuring user-friendly operation.

Cane sugar process optimization

- Diffusion: Rapid detection of disturbances, precise concentration control, reduced water and energy use, and optimized diffuser output.
- Evaporation: Regulates product flow to match evaporator capacity, conserves energy, and controls steam flow for optimal efficiency.
- Crystallization: Monitors mother liquor concentration to maintain supersaturation for crystal formation.

Beet sugar refining optimization

Integral at various stages, ensuring accurate measurements despite common errors like air bubbles and color variations, leading to better process control and productivity.

- Affination: Enhances separation of sugar crystals.
- Decolorization: Removes color impurities.
- Evaporation: Optimizes concentration process.
- Recovery: Improves sugar recovery efficiency.
- Crystallization: Ensures consistent crystal size, increases yield, and reduces reprocessing and false grain.

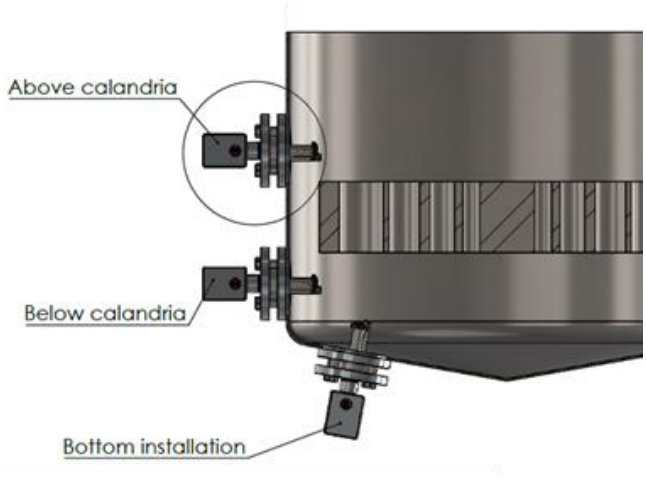
Applications

- Cane sugar milling and refining
- Beet sugar milling and refining
- Liquid sugar production
- Molasses
- Crystallization

Key features

- Accurate and permanent Brix calibration with no need for field adjustment or zero calibration
- Robust image detection that wors in both crystallizers and syrup measurements.
- Modern output options: 2x analog mA outputs and digital Modbus TCP output
- Measurement window stays hot and therefore clean in tank installations due to optimized heat loss through sensor construction
- Thanks to advanced camera technology and electronics, sensor functions reliably in 50-70°C ambient temperatures (bottom of the crystallizer). Temperature range of the camera is -40…85°C.
- Accurate measurement in pipe installations is achieved when using KxS flow cell designs
- Optional prism wash system and transmitter with durable enclosure available

Recommended DCM-20-P (Probe model) installation points in crystallizer using flange connection and adapter

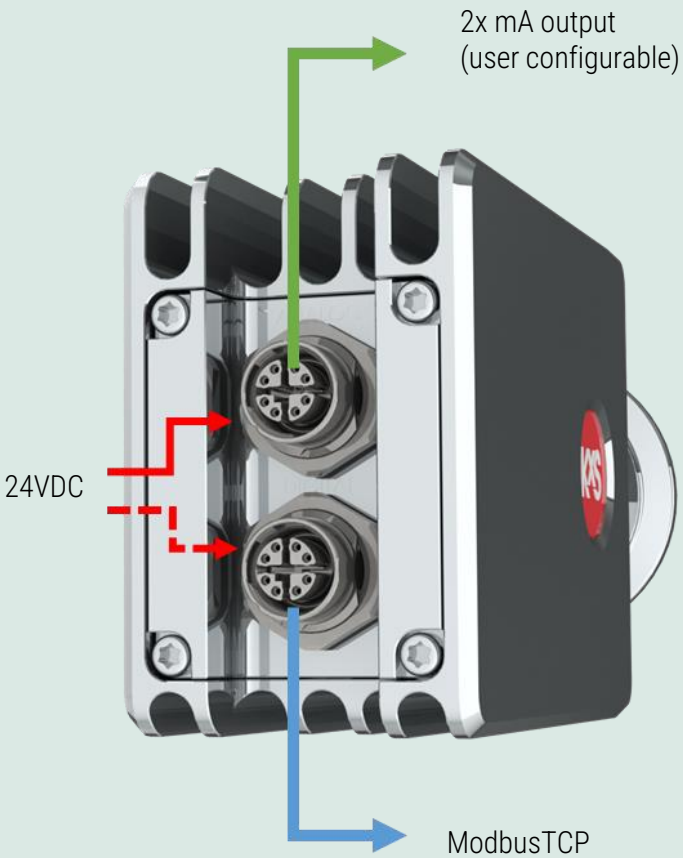


Digital and analog M12 connectors

The DCM-20 operates with a 24 VDC input power supply and offers flexible communication options, including analog (4-20 mA) and digital (Modbus TCP)

When using the analog signal, the digital port serves as a service port for configuration and diagnostics via a computer web browser, external display, or mobile device

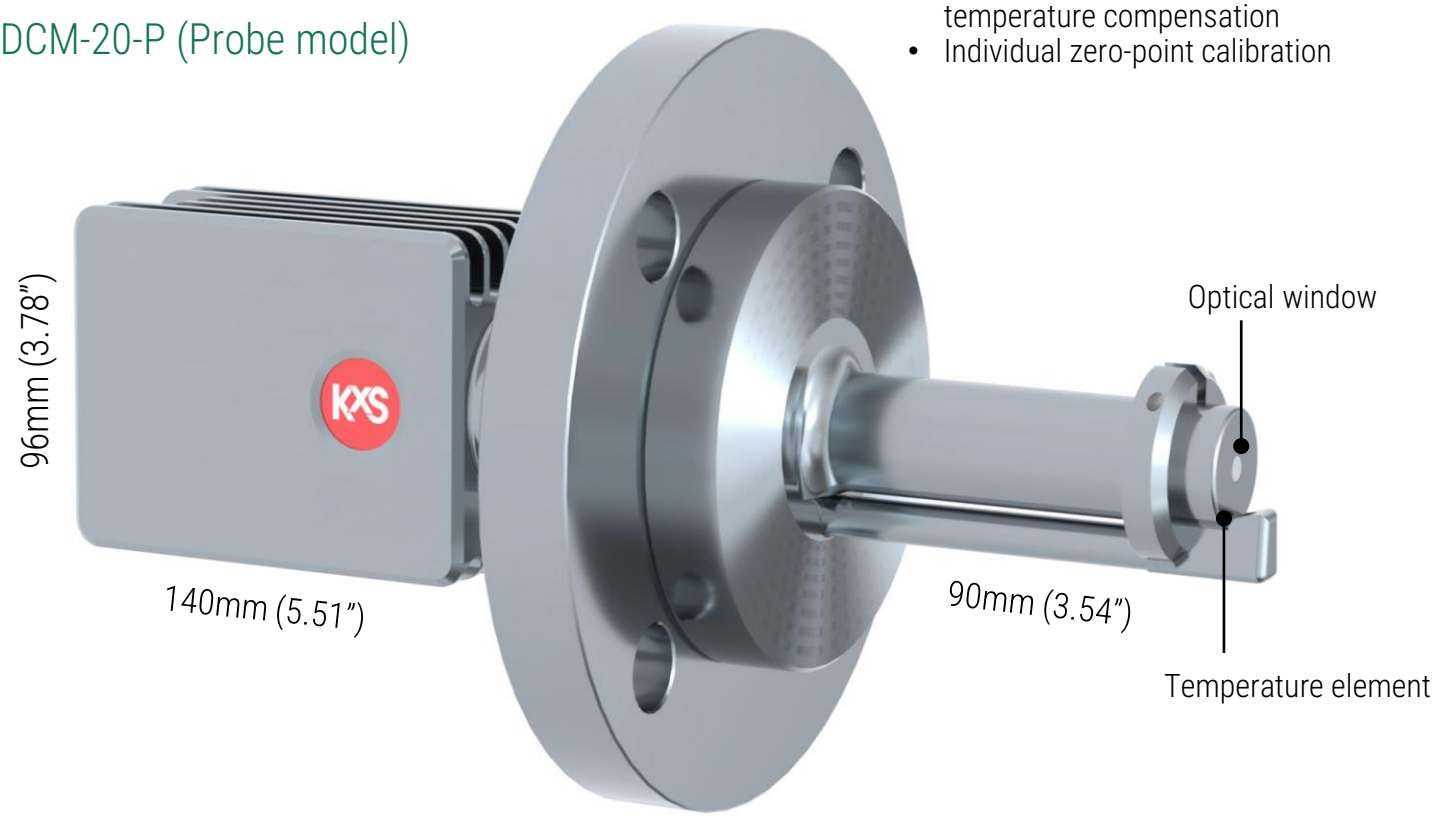
All port options can be utilized simultaneously, providing seamless integration and monitoring capabilities



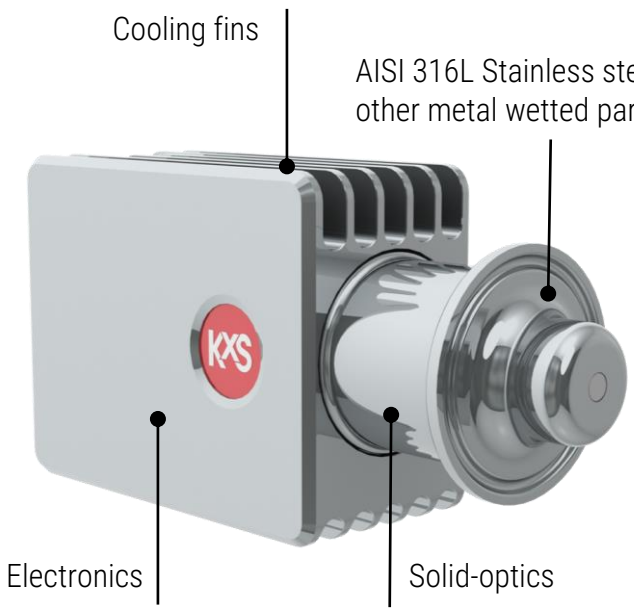
Key design features

- Solid optics module provides reliable thermal properties and rigidity
- Isolated electronics for true temperature compensation
- Individual zero-point calibration

DCM-20-P (Probe model)



DCM-20-L (Compact model)

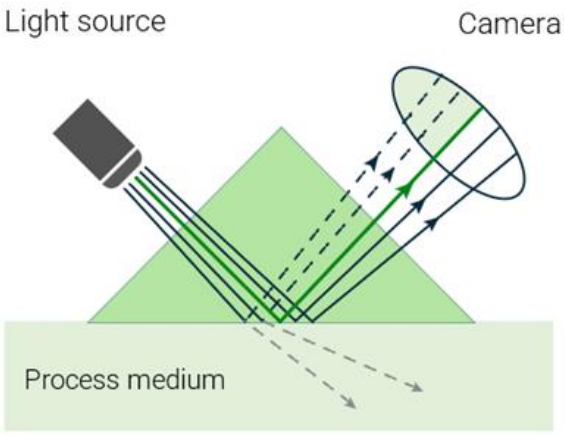


Optical refractive index measurement principle

KxS process refractometers DCM (digital concentration monitoring) employ the physical phenomenon of Refractive Index to define liquid concentration.

Optical concentration measurement is based on Snell's law and the critical angle of total reflection to provide precise readings.

Light is emitted from an LED and directed towards the interface between an optical window and the liquid being measured. As the concentration of the liquid changes, specific angles of the light are totally reflected and partially reflected back, producing light and shadow interface that is captured by a digital camera sensing element.



This interface is detected by the light-activated camera pixels and converted into refractive index (RI).

The RI values can be directly used or further translated into any concentration units, such as percentage by weight. This method ensures that measurement signals are provided instantaneously, allowing for real-time process control.

User interface

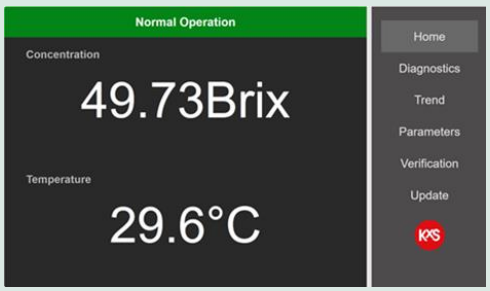
The DCM-20 measures refractive index and displays temperature-compensated concentration units in % by weight, density g/l or any engineering unit.

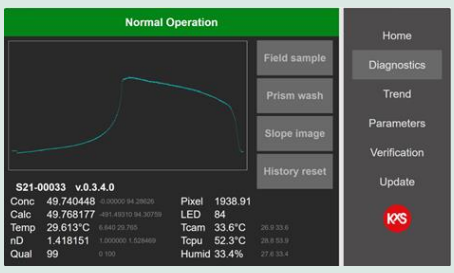
External displays with different sizes are available for connection through the sensor digital port. Computer, tablet or mobile phone with a web browser serves as user interface for accessing sensor diagnostics and settings.

Advanced optical image detection with proprietary pattern recognition.

Modular Connection Unit with wash relays

Web HMI





KxS Inline Brix refractometer DCM-20 for sugar specifications

Refractive Index range:	Full range, nD=1.3200...1.5300 (equal by definition to 0...100 Brix)
Output units:	Brix / Conc% / g/cm^3 / refractive index unit RIU
Measurement precision:	± 0.025%wt
Measurement accuracy:	± 0.0002 refractive index unit RIU
Speed of response:	1 sec. undamped
Optics:	No mechanical adjustments and digital measurement with 4000 pixel camera, 589 nm wavelength (sodium D-line) light emitting diode (LED), built-in Pt-1000 temperature sensor (linearization according to IEC 751)
Temperature compensation:	Automatic, individual zero-point calibration
Calibration:	NIST traceable calibration, verification with standard RIU liquids
Wetted parts:	AISI316L Stainless steel, Sapphire optical window, PTFE gasket Optional: Alloy 20, Hastelloy C-276, Titanium, Tantalum Sensor housing: AISI316 Stainless Steel
Process connection:	Industrial refractometer connections with DIN/ANSI/JIS flanges; L clamp or flow cell flanges / Hygienic refractometer connections with 1.5" and 2.5" tri-clamp or Varinline® Optional flow cell housing connections with sanitary or DIN/ANSI flanges
Process pressure:	-1...55 bar, 14.5...800 psi (depending on process connection)
Process temperature:	Industrial refractometer -40°C (-40°F)...150°C (302°F) continuous process temperature / Hygienic refractometer -15°C (5°F)...100°C (212°F) continuous process temperature Withstands 130 °C Clean-in-Place CIP and Steam-in-Place SIP sequences
Ambient temperature:	-40°C (-40°F)...65°C (149°F)
Sensor protection class:	IP67, Nema 4X
Installation:	Indoor/Outdoor, unclassified area
Sensor weight:	5.7kg, 12.6lbs (DCM-20-P probe model) 1.3 kg, 2.9 lbs (DCM-20-L compact model)

Outputs and connections:

Digital M12 connector:	24VDC power supply, Modbus TCP for user interface and PLC connection, normal cable length 10 m(33 ft), max 70 m(230 ft)
Analog M12 connector:	24VDC power supply, 2 pcs independent 4-20 mA user configurable outputs, normal cable length 10 m(33 ft), max, 200 m(660 ft). Max. load 1000 Ohm
Sensor Power consumption:	max. 2.5W
Options:	Modular Connection Unit enclosure with optional display/user interface Independent 7" or 15" Web HMI, full color touch screen interface, Optícal window wash with steam or high-pressure water. Direct integration with Rockwell's PLC for Ethernet IP communications ATEX/IECEx approval for Ex ec mc IIC t4 Gb/Gc

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