Excellence in in-situ refractive index measurement



KxS Concentration monitor DCM-10 for semiconductor wet chemicals control

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

The DCM-10 is renowned for its high accuracy and reliability, making it an essential concentration monitoring tool for incoming chemical check, wafer cleaning, chemical etching and chemical mechanical planarization (CMP).

The DCM-10 measures refractive index and displays temperature-compensated concentration units in % by weight or g/cm³.

The DCM-10 operates with a 24 VDC input power supply and offers industry standard communication options, including analog (4-20 mA) and digital (Modbus TCP).

DCM-10 optical concentration monitor is designed to:

- Define incoming clean chemical and raw CMP slurry density
- Achieve and ensure H2O2 conc% in CMP slurries for copper, tungsten and interlayer dielectric applications
- Correlate etch rate ER in e.g. wafer back side poly etch HNO3:HF and buffered oxide etch BOE
- Optimize bath life of post-etch residue removers like EKC265™ and other solvents in wet strip tools

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In-situ concentration monitoring in wafer cleaning tools

- Map and reduce chamber to chamber variability
- Optimize the chemical bath. In the hot SC-2 sequence the data shows a slight decreasing trend. May indicate H2O2 degradation.
- DIW rinse time may be reduced for higher throughput
- Proof would be Photo Limited Yield and Metal 1-Layer test in defect characterization
- Fault detection

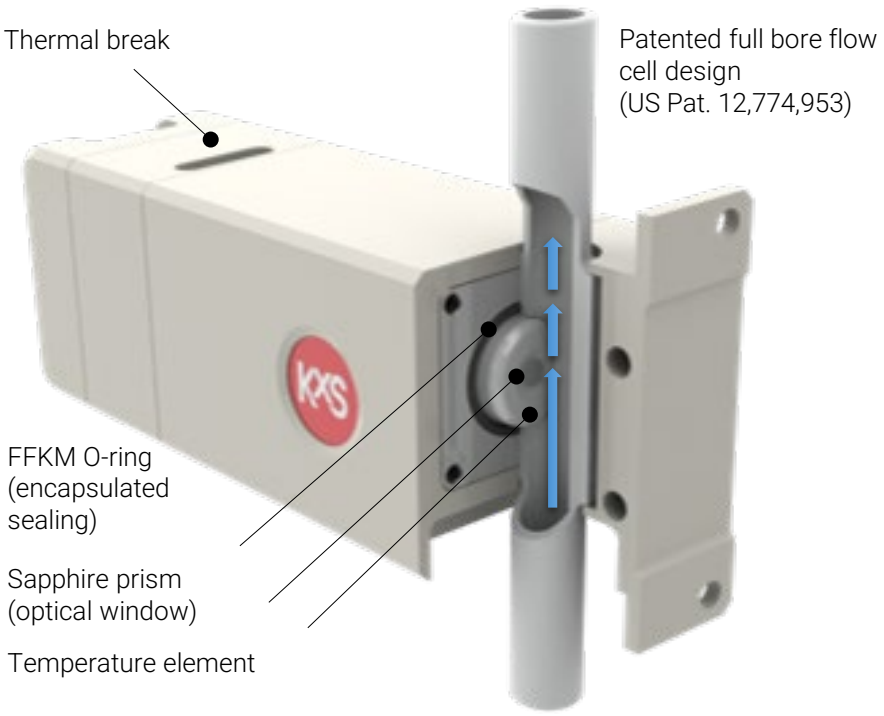


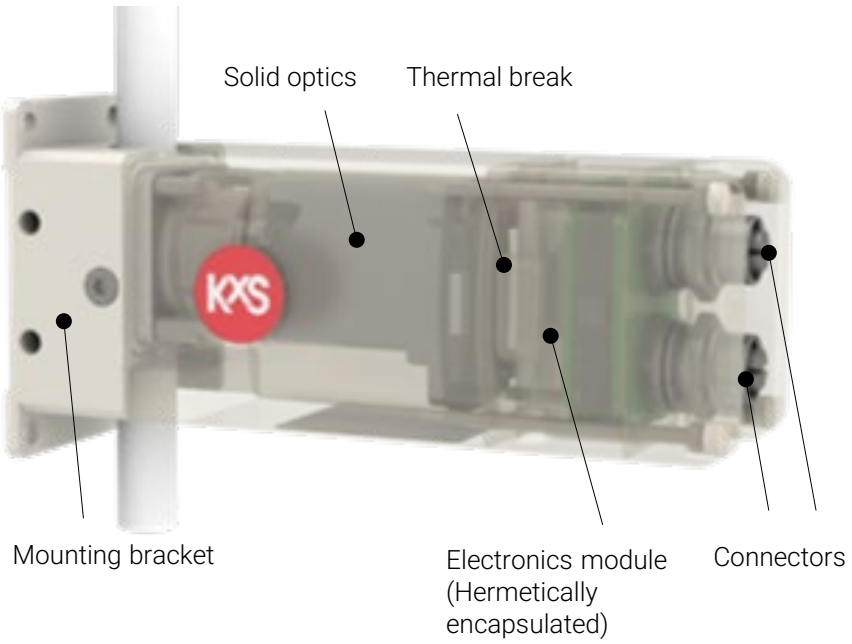
Key features

- True standalone operation: All measurement functions contained within the sensor, eliminating the need for an external transmitter
- Dual-body construction: Optical components remain intact even if the flow cell is removed, ensuring consistent performance.
- Material compatibility: Materials designed to withstand the demanding conditions of semiconductor processing in the basement and cleanroom environments
- Thermal management: Solid optics module provides excellent thermal properties, rigidity and weight reduction.
- Isolated electronics for true process temperature measurement and compensation.

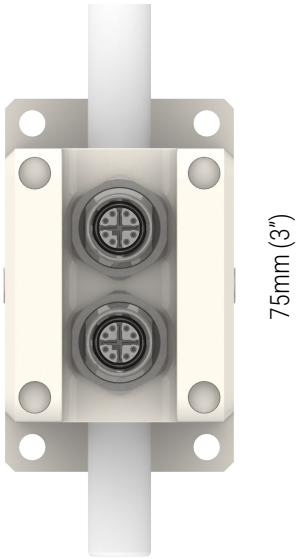
Excellent flow properties

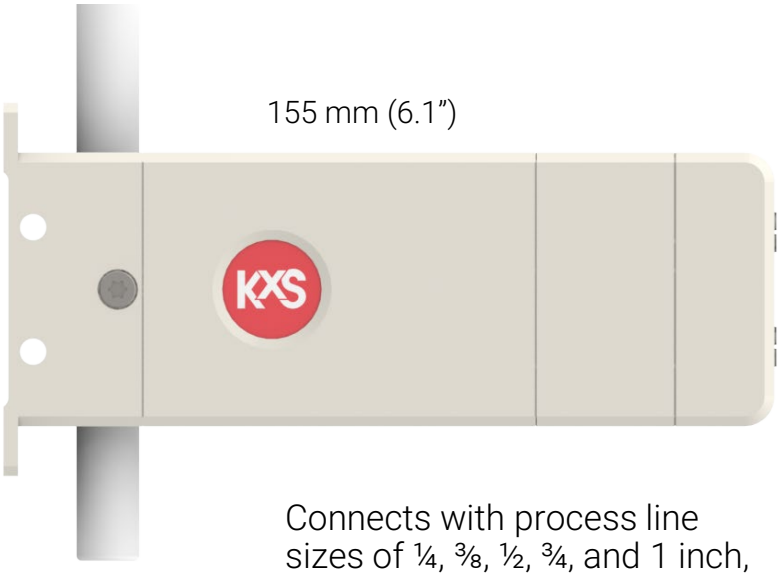
- Patented true full bore (US Pat. 12,774,953): Ensures optimal flow in the internal locus of flow cell.
- Optimized laminar flow: Minimizes shear force on liquids.
- Our unique internal laminar flow path near the measurement window ensures no shear forces on sensitive fluids and no pressure drop in the process.





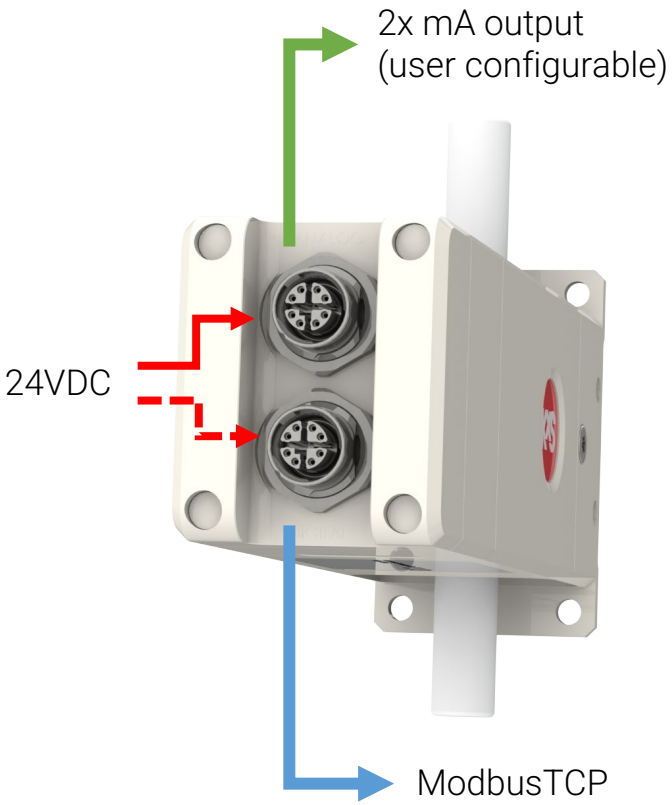
Extra small footprint design and easy installation





Connects with process line sizes of ¼, ⅜, ½, ¾, and 1 inch, using standard fittings (Flare or Pillar) directly in the process line

Digital and analog M12 connectors



The DCM-10 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

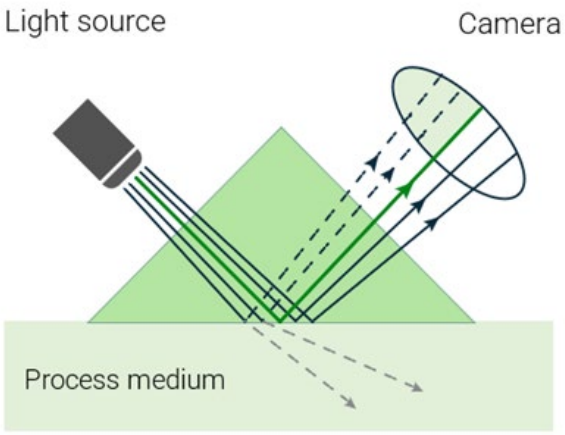
All port options can be utilized simultaneously, providing seamless integration and monitoring capabilities

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.

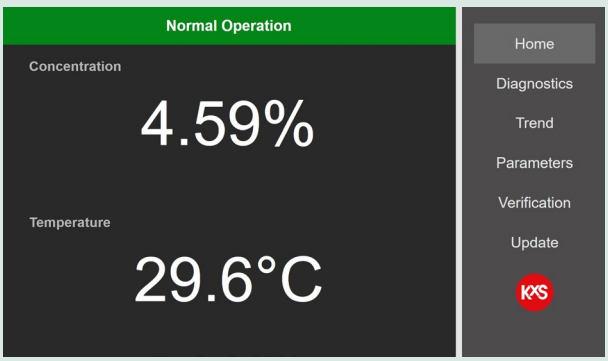


This interface is detected by the light-activated camera pixels and converted into refractive index (RI).

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.

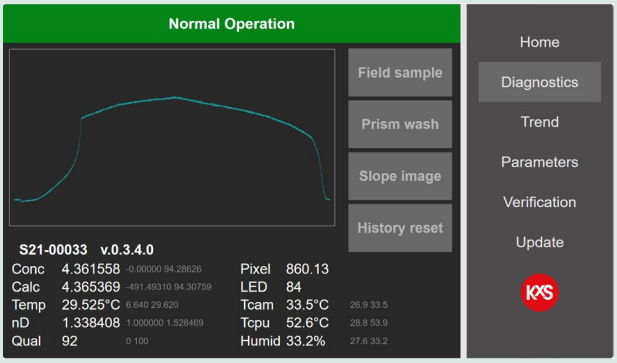
User interface

The DCM-10 measures refractive index and displays temperature-compensated concentration units in % by weight or g/cm³. All measurement functions are integrated in the sensor in a stand-alone setup, no transmitter is required.



However, 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.

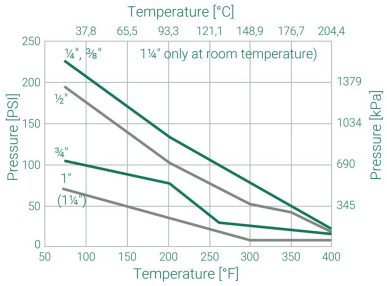


DCM-10 concentration monitor specifications

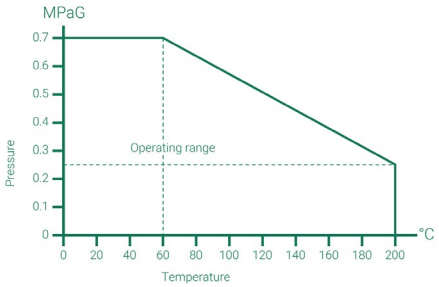
Refractive Index range, standard:	Full range, nD=1.3200...1.5300 (equal by definition to 0...100%wt)
Output units:	RI (refractive index) / Conc% / g/cm^3
Measurement precision:	± 0.025 %wt
Measurement accuracy:	± 0.0002 refractive index unit
Temperature accuracy:	±0.75°C in range 20-40°C. Standard deviation 0.05°C
Speed of response:	1s undamped
Optics:	No mechanical adjustments and digital measurement with 4K camera element, 589 nm wavelength light emitting diode (LED), built-in Pt-1000 (1/3B) temp sensor (linearization according to IEC 751)
Temperature compensation:	Automatic, individual zero point calibration
Calibration:	NIST traceable calibration, verification with standard RI liquids
Wetted parts:	PFA, Sapphire, ECTFE, Encapsulated sealing: FFKM O-ring
Sensor housing:	Polypropylene(PP)
Patented flow-through design:	Offers true laminar flow path with prism forming part of the channel wall. (US Pat. 12,774,953)
Process connection:	Standard tube ends for Flare, Pillar Type or PrimeLock®, Tube sizes: ¼", ⅜", ½", ¾" or 1"
Process temperature:	0°C (32°F)...85°C (185°F)
Ambient temperature:	Sensor: 0°C (32°F)...45°C (113°F); Modular Connection Unit MCU -10 °C (14°F)...45°C (113 °F)
Process pressure:	Depends on process temperature, fitting type and tube size; see diagrams below

(Fitting pressure ratings shown. Maximum DCM-10 process temperature: 85°C (185 °F))

Flare fittings



Pillar fittings



Sensor protection class:	IP67, Nema 4X
Sensor weight:	330g (11.6 oz)

Outputs and connections:

Digital M12 connector:	24VDC power supply and Modbus TCP, cable lengths 2-10m (6-33ft), max, 70m(230ft)
Analog M12 connector:	24VDC power supply and 2x independent 4-20mA outputs, standard cable length 10m(33ft), max, 200m(660ft). Max. load 1000 Ohm
Sensor power consumption:	max. 2.5W
Options:	Modular Connection Unit MCU with enclosure, display/user interface Independent 7" Web HMI, full color touch screen interface Communication protocol PLC software add-on from Modbus TCP to Ethernet IP. Protocol converter module from Modbus TCP to Profinet ATEX/IECEx approval for II 2/3 G Ex ec mc IIC t4 Gb/Gc

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