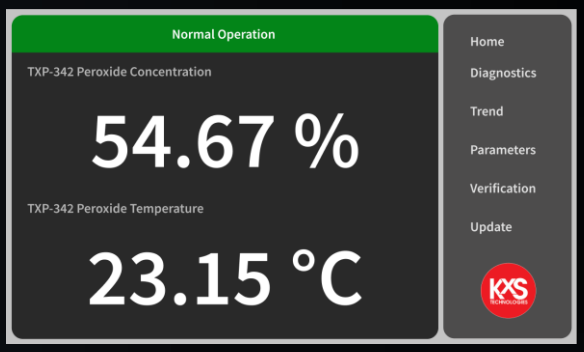
DCM-10
INLINE CONCENTRATION MONITOR FOR CRITICAL FAB WET CHEMICALS

PB.DCM-10.A.09

APPLICATIONS

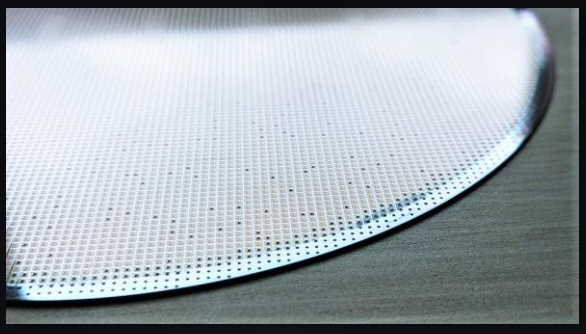
DCM-10 optical concentration monitor is designed to:

- **Define** incoming clean chemical and raw CMP slurry density
- **Achieve and ensure** H_2O_2 conc% in CMP slurries for copper, tungsten and interlayer dielectric applications

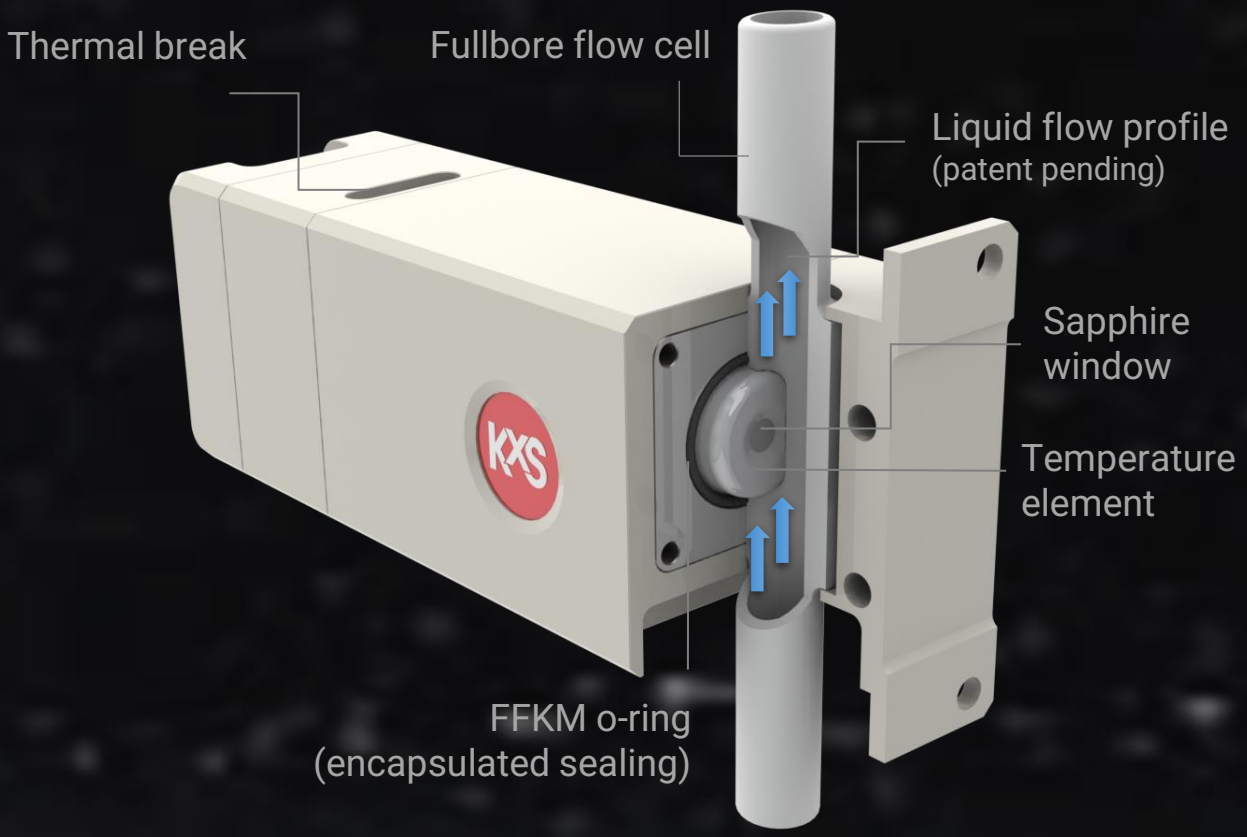


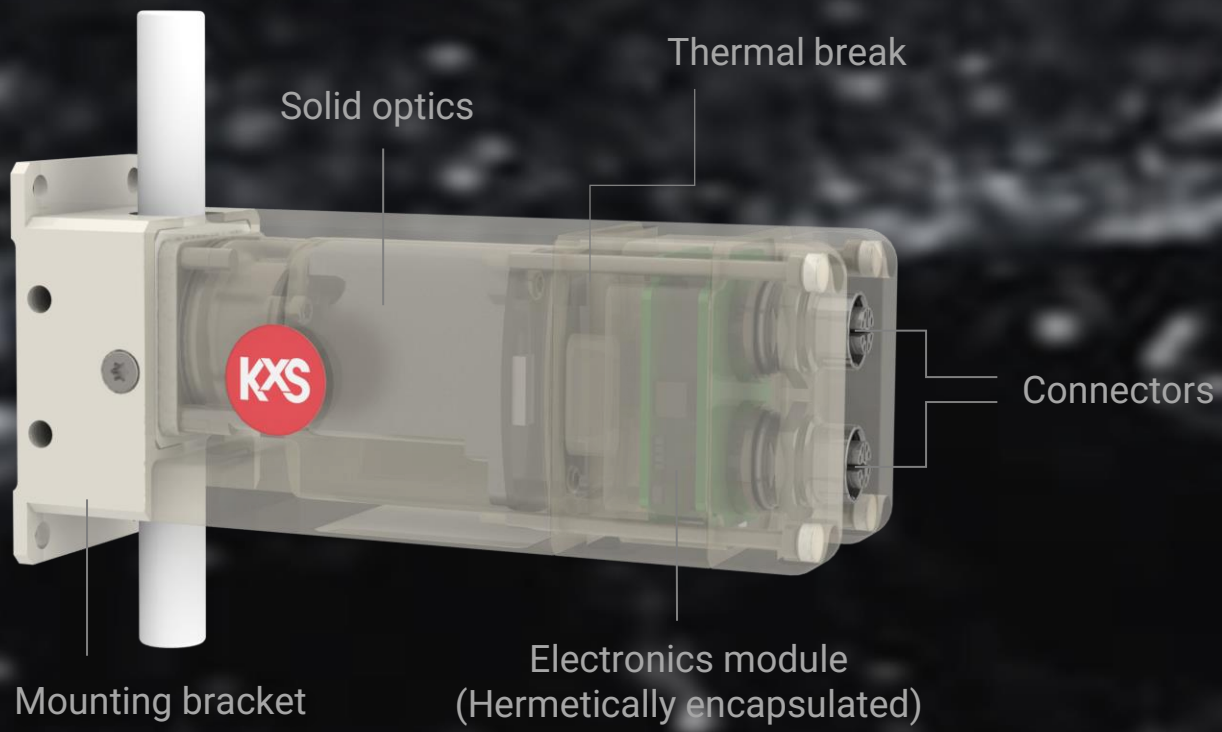
- **Correlate** etch rate ER in e.g. wafer back side poly etch HNO3:HF and buffered oxide etch BOE
- **Optimize** bath life of post-etch residue removers like EKC265™ and other solvents in wet strip spinning tools

Other typical application uses:

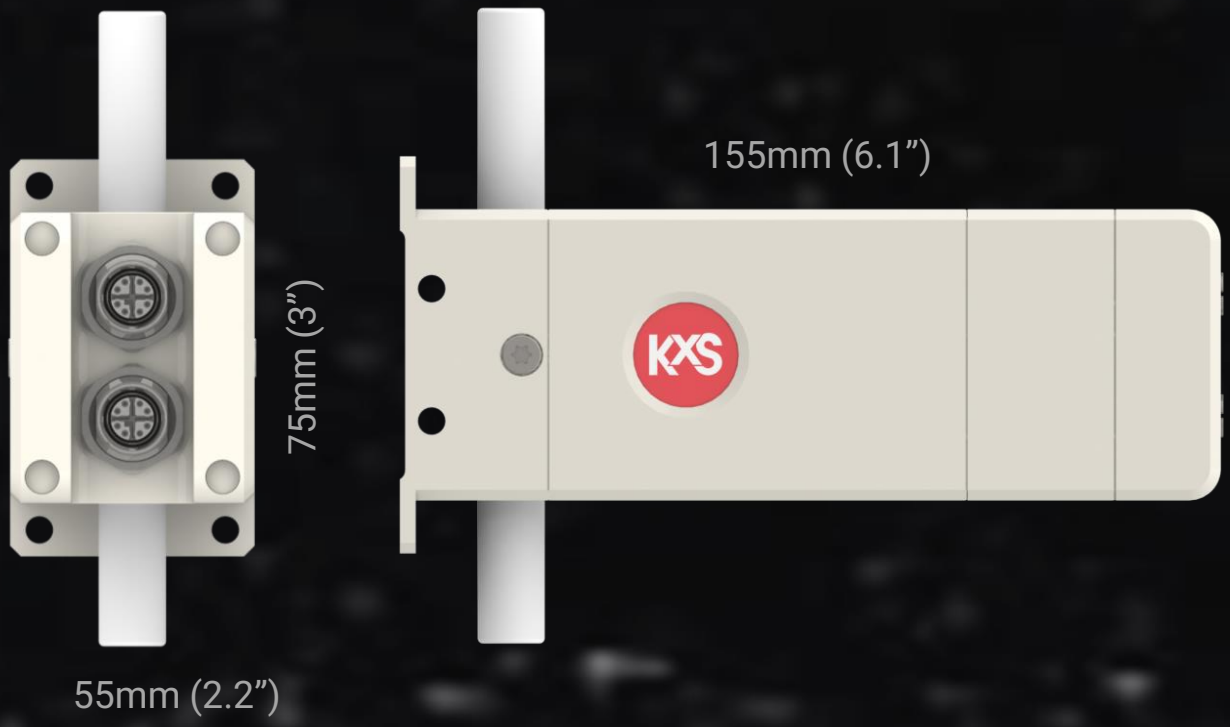


- Chemical feed and blend verification of SC-1 and SC-2
- Silicon wet etch with 50% KOH
- Titanium etch with H_2SO_4:HNO_3:H_3PO_4 blends
- Post-CMP cleans with various mixtures


Thermal break
Fullbore flow cell
Liquid flow profile
(patent pending)
Sapphire
window
Temperature
element
FFKM o-ring
(encapsulated sealing)

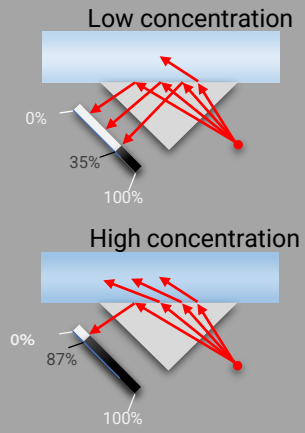

Thermal break
Solid optics
Connectors
Mounting bracket
Electronics module
(Hermetically encapsulated)

¼”…1” Full bore flow cells for industry standard connections (Flare, Pillar)

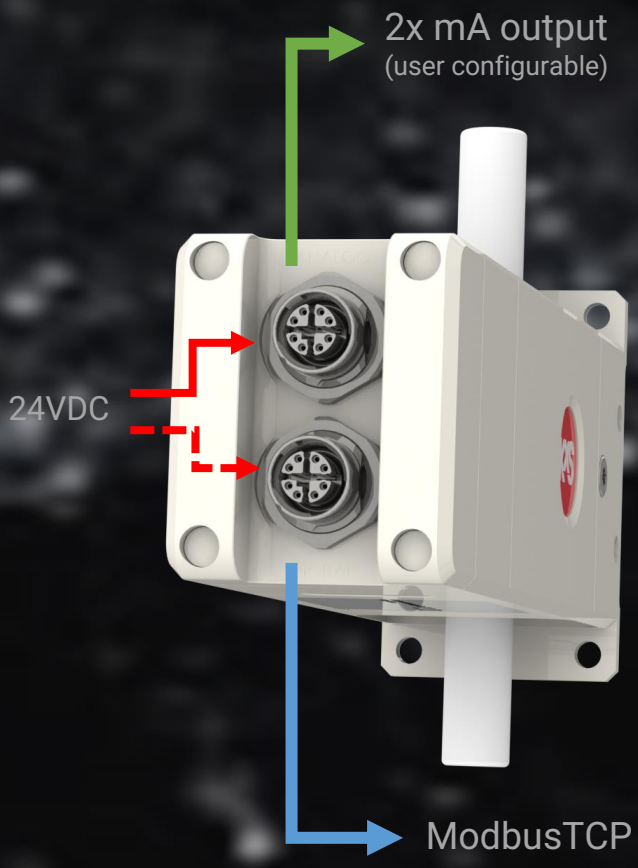


Measurement principle

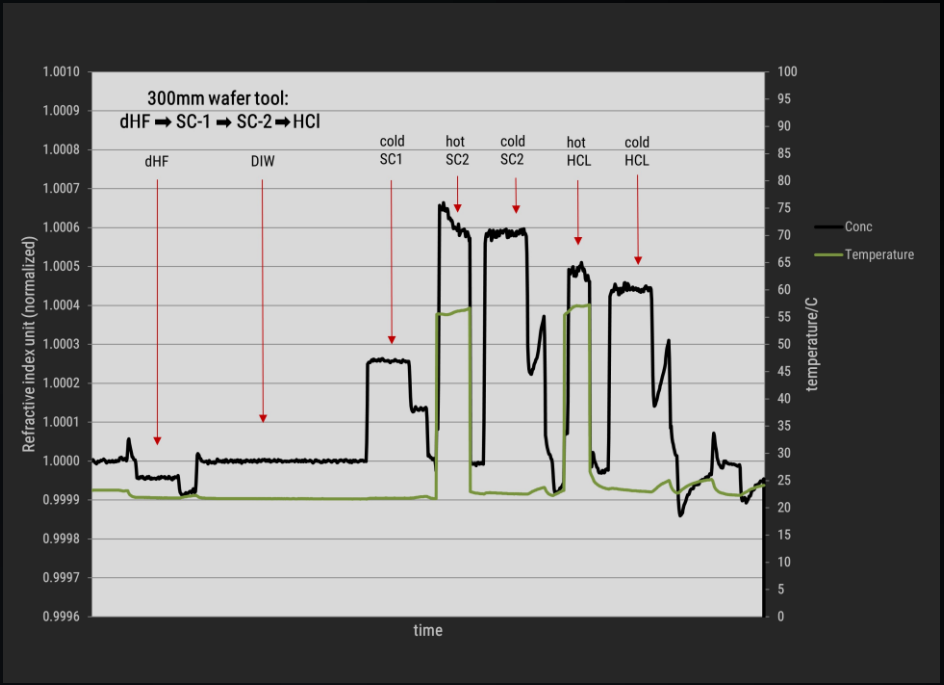
The optical concentration measurement is based on *Snell’s law* and *critical angle of total reflection*. Light is transmitted from the LED to the interface between the optical window and the liquid. With the concentration of the liquid, defined angles are reflected back creating light and shadow interface images on the digital camera. The interface of the light activated pixels is converted to refractive index units and concentration values.



Digital and analog M12 connectors

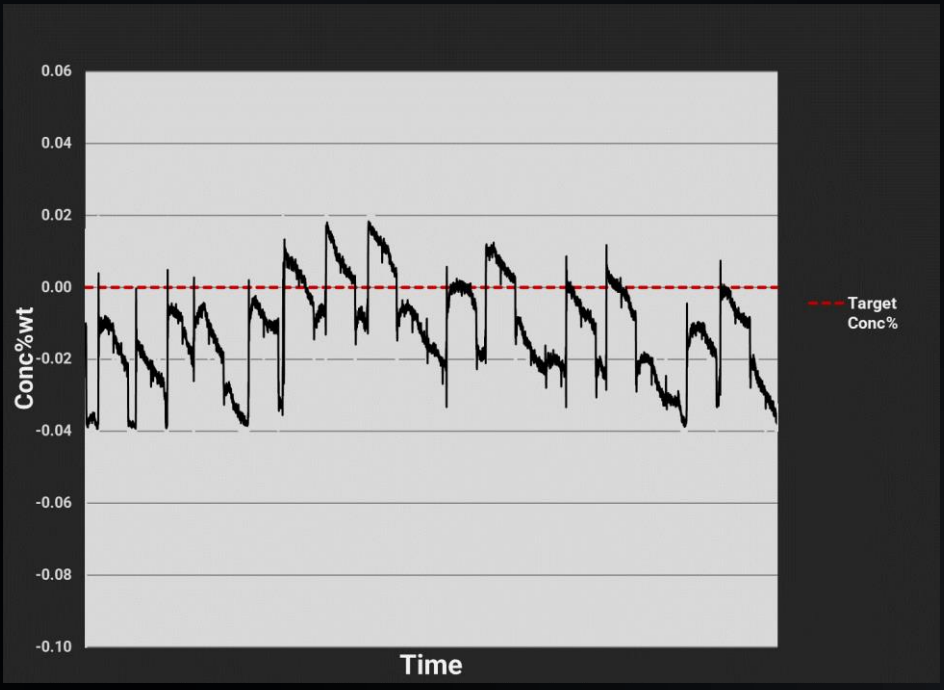


ONE MOTIVATION:
Reduce mix-to-mix and chamber-to-chamber variability



Distinct interface detection of

- dilute HF
- DIW flush
- cold SC-1
- hot SC-2
- cold SC-2
- hot HCl
- cold HCl



Chemical spiking and dispense

- H2O2 in CMP slurries
- H2O2 NH3 water and HCl in tool in-situ blending
- Incoming CMP slurry density

DCM-10 concentration monitor specifications

Refractive Index range, standard:	Full range, nD=1.3200...1.5300 (equival by definition to 0...100%wt)
Output units:	RIU (refractive index unit) / Conc% / g/cm^3
Measurement precision:	± 0.025 %wt
Measurement accuracy:	± 0.0002 refractive index unit
Speed of response:	1s undamped
Optics:	No mechanical adjustments and digital measurement with 4K camera element, 589 nm wavelength (sodium D-line) 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)
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:	0°C (32°F)...45°C (113°F)
Sensor protection class:	IP67, Nema 4X
Sensor weight:	330g (11.6 oz)
Outputs and connections:	
Digital M12 connector:	24VDC power supply and Modbus TCP, conversion to other protocols with converter module, cable lengths 2-10m (6-33ft), max, 70m(230ft)
Analog M12 connector:	24VDC power supply and 2x independent 4-20mA outputs, normal cable length 10m(33ft), max, 200m(660ft). Max. load 1000 Ohm
Sensor power consumption:	max. 2.5W
Options:	Modular Connection Unit, 4", 7" or 15" 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

We reserve the right to technical alterations

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