

AN ACCURATE HEAVY-DUTY
INSTRUMENT FOR IN-LINE
MEASUREMENT OF
CONCENTRATION

K-PATENTS
PROCESS INSTRUMENTS



PROCESS REFRACTOMETER PR-01-S

APPLICATIONS



FOOD INDUSTRY

Sugar: Extraction, press water, thick juice, vacuum pan, molasses. Corn syrup, fructose, glucose, xylose, maltose. Sorbitol, mannitol, lactitol. Calcium lactate. Milk products: lactose, lactulose, lactic acid, condensed milk, whey, skim milk, caseinate. Fruit concentrate, citrus juices, soft drinks, beer wort, grape juice, coffee. Flavors, jams, jellies, yeast extract. Gelatine, protein. Tomato paste. Hydrogenated oils, fats.

PULP & PAPER

Black liquor: Blow line, pulp washing, evaporator, recovery boiler safety. White liquor. Green liquor. Sulphite cooking liquor, red liquor. Lignin. Paper mills: Starch, sizing materials, PVA, CMC, alum.

CHEMICAL INDUSTRY

Hydrogen peroxide. Sodium chloride, sodium hydroxide, sodium gluconate, sodium sulphate, potassium carbonate. Aluminium sulphate. Magnesium chloride. Strong sulphuric acid, citric acid, selenious acid. Formaldehyde, urea. Nylon salt, caprolactam, cyclohexanon,. Soap solutions, detergents. glycol, glycerol. Amino acids, amine oxide. Glues, water based lubricants. Petrochemical: Lube oils, waxy raffinates, oxitols.

RESEARCH

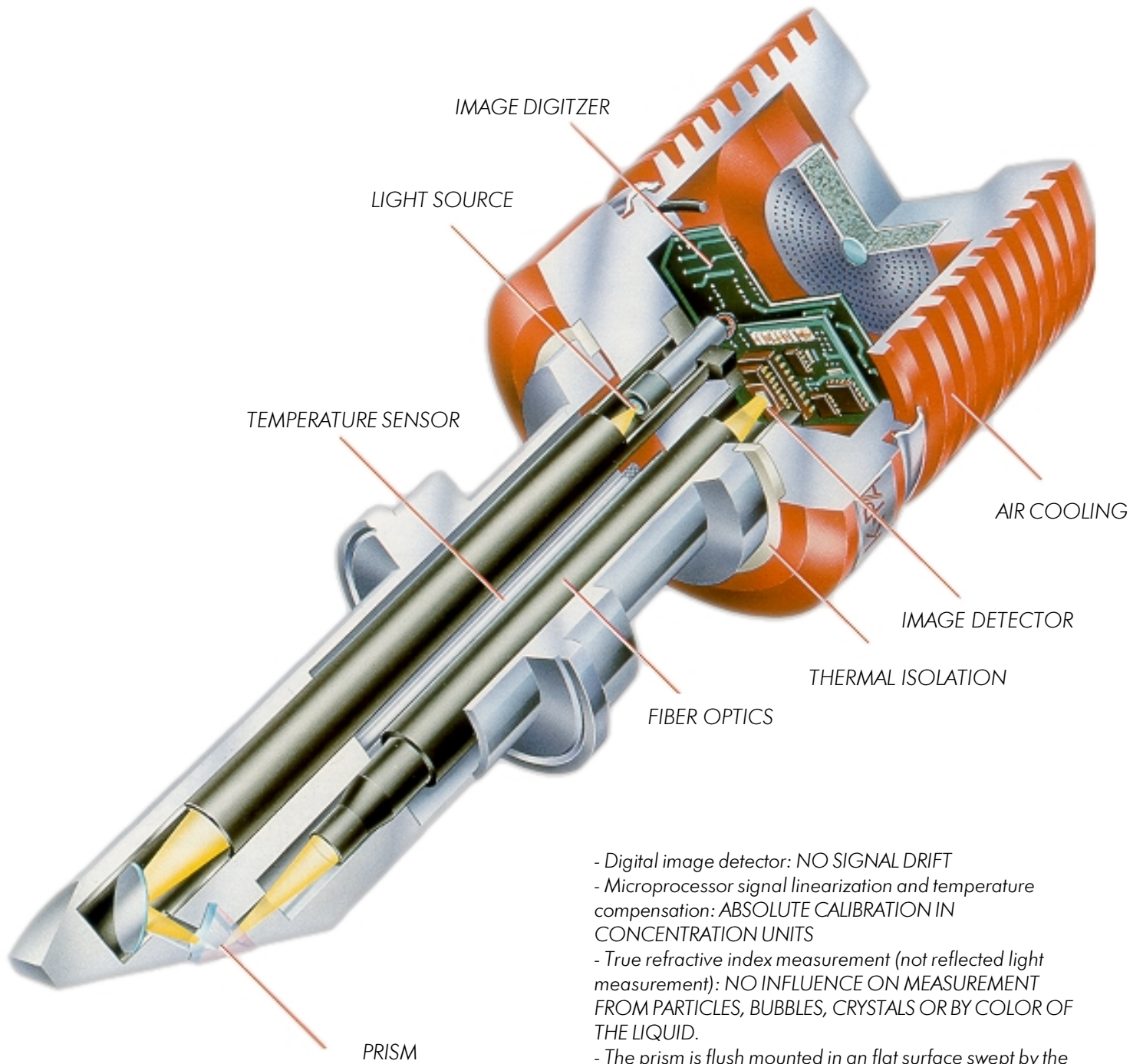
Technical universities. Company research departments. Research institutes: Pulp & Paper, Food, Chemical.



FOR BATCH OR CONTINUOUS PROCESSES

K-PATENTS PROCESS REFRACTOMETER

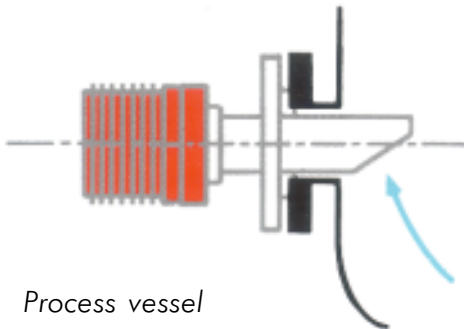
UNIQUE DESIGN



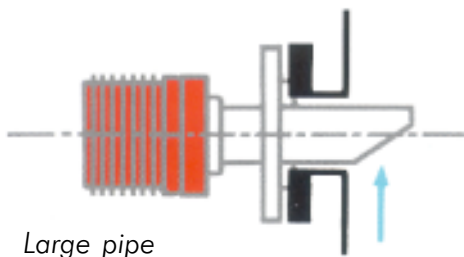
- Digital image detector: NO SIGNAL DRIFT
- Microprocessor signal linearization and temperature compensation: ABSOLUTE CALIBRATION IN CONCENTRATION UNITS
- True refractive index measurement (not reflected light measurement): NO INFLUENCE ON MEASUREMENT FROM PARTICLES, BUBBLES, CRYSTALS OR BY COLOR OF THE LIQUID.
- The prism is flush mounted in an flat surface swept by the main flow: PRISM STAYS CLEAN
- Air cooling = NO COOLING WATER
- Rugged, modular design and light emitting diode (LED) as light source: NO REGULAR MAINTENANCE NEEDED.

INSTALLATION

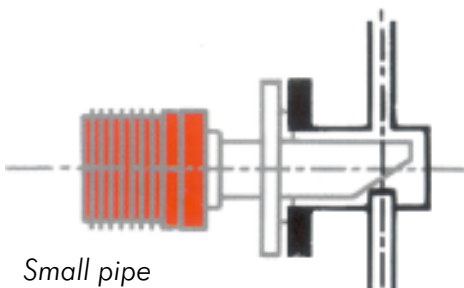
Delivery consists of three parts: Sensor, Indicating transmitter and interconnecting cable. The cable is ready for connection. The sensor is mounted in the process by a piece of standard pipe and a standard flange or clamp. A nozzle for prism wash with steam or hot water is recommended in some applications.



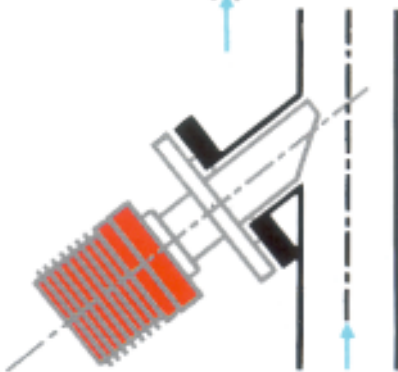
Process vessel



Large pipe



Small pipe



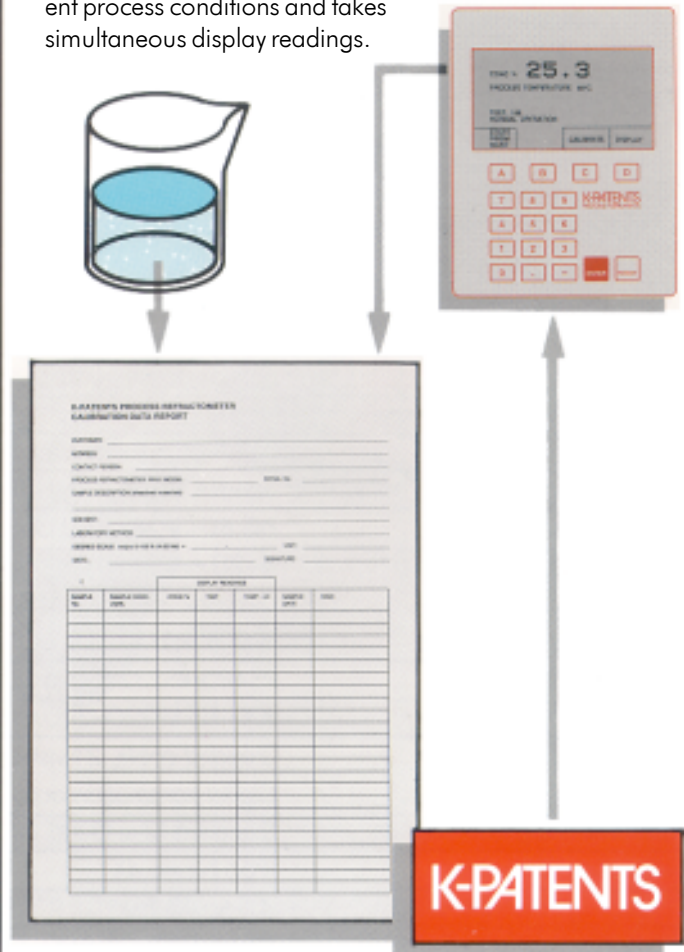
Medium pipe (diam. 80...150mm, 3"...6")

CALIBRATION

To obtain full agreement between refractometer indication and user's laboratory determinations, the instrument may need adjustment. The user can make the adjustment himself using conventional methods, but he can also use the adjustment service provided by K-Patents:

FIELD CALIBRATION

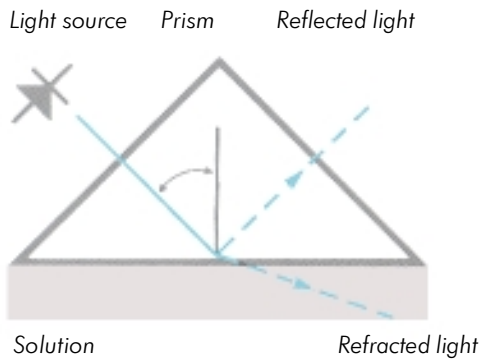
The user takes samples under different process conditions and takes simultaneous display readings.



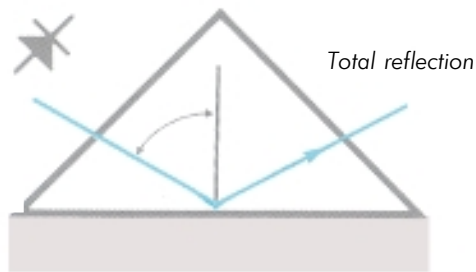
The user completes the Calibration Data Report

and sends it by fax to K-Patents, which will provide new calibration parameters to be entered using the Refractometer Keyboard

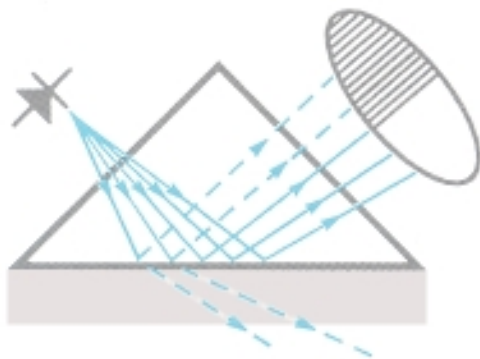
PRINCIPLE OF MEASUREMENT



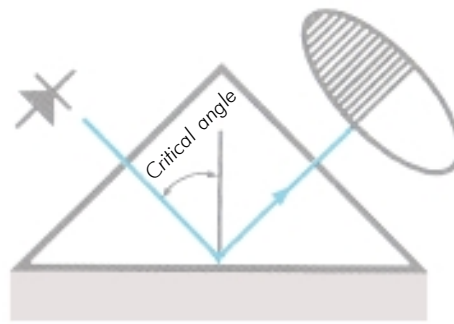
When a light ray meets a surface wetted by a solution at a steep angle, part of the light is reflected, part is refracted.



However, if the angle is flat, all light is reflected; total reflection occurs.



In a process refractometer light rays of different angles are directed at the wetted surface. Thus an optical image with a dark sector and a light sector is created.

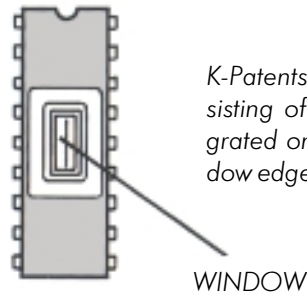


The angle corresponding to the shadow edge in the optical image is called the Critical Angle of Total Reflection.

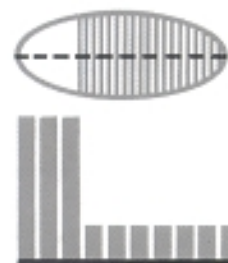
THE CRITICAL ANGLE OF TOTAL REFLECTION IS A FUNCTION OF THE CONCENTRATION OF THE SOLUTION.



If the position of the shadow edge is determined then the concentration of the solution is measured.



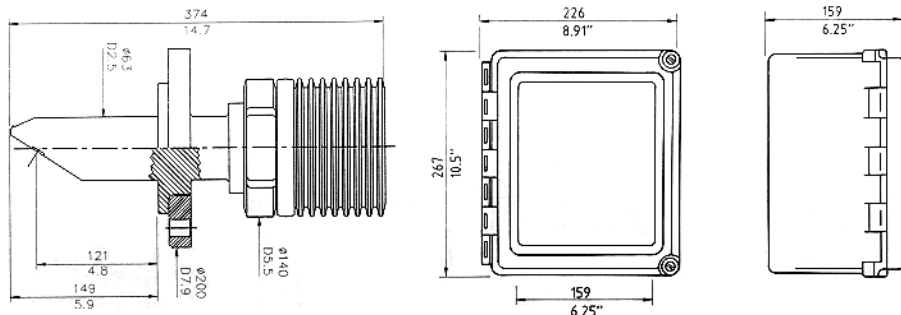
K-Patents uses an optical detector consisting of a row of 256 photocells integrated on one chip to measure the shadow edge position.



This optical detector transforms the optical image point-by-point to an electrical signal. The optical image can be shown on the display as a row of pulses: The high pulses correspond to the photocells in the light area. The exact position of the shadow edge will be located by the microprocessor and converted to reading in concentration units.

SPECIFICATIONS

DIMENSIONS



DATA

Refractive Index ranges:	Low range: R.I. 1.320...1.460 High range: R.I. 1.380...1.530
Max span:	R.I. 0.08
Accuracy:	R.I. ± 0.0002 (corresponds typically to $\pm 0.1\%$ by weight). Repeatability and stability correspond to accuracy.
Speed of response:	0.8 s undamped
Damping time constant:	Selectable up to 5 min
Process temperature:	max. 150°C (300°F), for higher temp. consult factory
Ambient temperature:	max. 45°C (113°F), min. -20°C (-4°F),
Process pressure:	Flange connections up to 25 bar (350 psi), Sanitary clamp max. 15 bar (200 psi) at 20°C (70°F)/9 bar (125 psi) at 120°C(250°F).
Recommended flow velocity:	above 1.5 m/s (5 ft/s)
Wetted parts:	AISI 316L stainless steel, prism gaskets Kalrez
Sensor weight:	Sandvik clamp 7 kg (15 lbs)/Flange DIN/ANSI/JIS 10.5 kg (23 lbs)
Process connection:	NS 80 (3" Sch 10 S) (Sandvik clamp/Flange DIN/ANSI/JIS/Sanitary clamp)
Current output:	4-20 mA/0-20mA, max.load 1000 Ohm. Galvanic isolation 1500 V DC or AC (peak). Built-in hold function during prism wash.
Serial output:	RS485/RS232 Galvanic isolation 500V DC or AC (peak).
Power:	100-115 V/220-240 V, 50/60Hz, 15 VA
Interconnecting cable:	Shielded cable, 2 twisted pairs with individual shields, 0.5 mm ² Digital transmission according to RS485
Interconnecting cable length:	Standard 10m (33 ft), max 100 m (330 ft)
Indicating transmitter:	IP66 Nema 4X
Indicating transmitter weight:	4,5 kg (10 lbs)
Options:	-Long probe version -Wetted parts. Hastellay C, titanium or palladium doped titanium
Accessories:	-Relay unit for automatic prism wash/alarms -Prism wash nozzle -Retractor and isolation valve

ORDERING INFORMATION:

- Desired scale, properties of process solution
- Process temperature and pressure range
- Process flow range and pipe diameter
- Desired process connection
- Length of interconnecting cable
- Supply voltage and frequency
- Options and accessories
- Customer tag

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We reserve right to technical alterations.