



Slurry Liquor Phase Density Analyser

Caustic/Acid Concentration Analyser for Slurries and Liquors

AL-CAR-K





INTRODUCTION

AL-CAR-K is a ruggedized in line sensor that provides continuous real-time slurry liquor phase density using refractive index. Refractive index sensors are extensively used in many process environments in industries such as sugar, pulp and paper, chemical and food. The AL-CAR-K has been adapted to cater for measurement obstacles which are created by the rigors of the alumina process such as scaling and erosion.

FEATURES AND BENEFITS

- Precise in-line real-time monitoring of slurry liquor-phase density
- Drift-free measurement corresponding typically to within 0.5 grams per litre soda
- No calibration required
- Rugged probe designed specifically for the Alumina Industry
- Allows the user to install the sensor directly in the main process pipe eliminating the need for costly high maintenance side streams and sample lines
- Measurements are not affected by flow rate so the unit can also be installed in any pipe line size



FIG 1. AL-CAR-K

DESIGN

- Unique design with completely digital sensing techniques: no moving parts
- Jacking bolts to facilitate removal from process
- Digital transfer of data between the sensor and indicating transmitter
- Rugged all stainless steel external design
- Temperature compensation for changes in process temperature
- SAF2205 wetted parts with a PSZ ceramic tip. Optional exotic wetted parts available



APPLICATIONS

The AL-CAR-K is suited for red and white side alumina processes. This product can be used to monitor liquor-phase density in areas such as the Digestion Blow Off (DBO)/ Last Flash Tank and precipitation feed to provide accurate and repeatable control point measurements, resulting in large savings in production costs. In applications where the A/C ratio or molar ratio varies significantly, we recommend using the AL-CAR-K in conjunction with a conductivity device (AL-DCIK) or periodic lab sampling to assist incomplete concentration control. A typical installation can be seen in figure 2.

The AL-CAR-K is also suitable for measurements of pressure acid leach (PAL) blow off in nickel refining. By monitoring the dissolved liquor components, free acid can be calculated and controlled. This impacts on pH levels resulting in less trace metals in the pregnant liquor as well as decreasing acid usage whilst increasing production with less down time.



FIGURE 2. AL-CAR-K TYPICAL INSTALLATION

MEASUREMENT METHOD

Every liquid has a Refractive Index (RI). RI is defined as the light bend angle of the liquid. The bend angle is directly proportional to the liquid concentration or density. In the AL-CAR-K, light is directed against the interface between a prism and the process solution. The fan of light meets the surface at different angles where fully reflected rays and partially refracted/reflected rays form an image (figure 3). The optical image is analysed by a microprocessor and the shadow edge interface is determined. The interface between the light and dark area is known as the critical angle. The critical angle changes depending on the RI of the solution, which correlates to the liquor phase density. Measuring the critical angle rather than total reflected light provides complete immunity to suspended solids and entrained air.

The key with RI over other density measurement techniques is that RI measures the liquid phase of the solution, not the total density. In the Alumina Industry, this enables accurate analysis of the caustic/soda concentration without needing to compensate for variations in suspended solids.

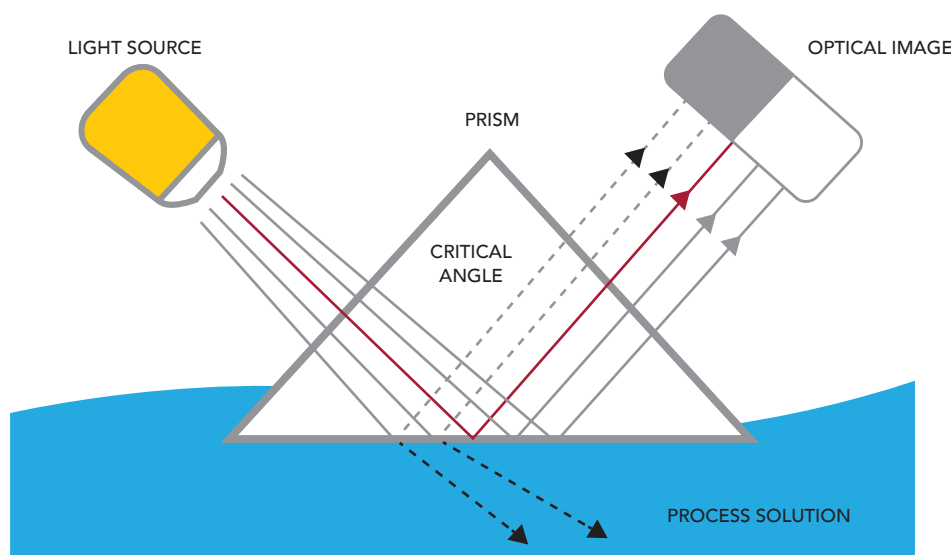


FIGURE 3. AL-CAR-K PRINCIPLE OF MEASUREMENT



SPECIFICATIONS

- Refractive Index ranges: 1.31 to 1.54 RI capable range 0 to 1000 gpl soda
- Accuracy: Better than ± 0.0002 R/I correspond 0.5 gpl soda repeatability and stability corresponds to accuracy.
- Speed of response: 0.8 seconds.
- Process temperature: Up to 150 deg C or higher. Consult PLA.
- Ambient temperature: -30 to +55 deg C
- Process pressure: Up to 200 psi
- Recommended flow velocity: 1.8 to 2.7 Meters per second.
- Wetted part sensor body: SAF2205 / PSZ Ceramic
- External sensor and transmitter: 316 ss
- Process connection: 3" ANSI 150# or 300#RF (DIN also available)
- Complete with: 3/4" Jacking bolts to facilitate removal.
- Output signals: 4-20 mA / 0-20 mA max load 1000-ohm, serial output RS485 / RS232, ethernet IP.
- Power: 24Vdc / 110Vac / 240Vac
- Interconnecting cable: Standard 10 meters. Maximum 100 meters.
- IP rating: IP65 / NEMA 4X for sensor and transmitter.
- Options: Various exotic sensor body materials.



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PRECISION LIGHT AND AIR PTY LTD
17 SIR LAURENCE DRIVE, SEAFORD, VIC 3198 AUSTRALIA
P +61 (0)3 9786 1711 • E sales@plapl.com.au
www.plapl.com.au