

Potassium Content Measurements Using the LB 444K



Potassium content measurement for the Potash Industry is a most difficult and challenging measurement. It is a necessary component of the production process and essential to the efficient production of Potash.

Potassium contains the radioactive isotope K40. However, this isotope is found in extremely small quantities in the ore itself (Only 0.012% of Potassium contain the K40 isotope). Detection of this radioactive isotope can establish a relationship between the KCL (Potassium Chloride) and Potassium Oxide (K₂O). With this relationship, the quantity of the K₂O can be determined in the ore.

However, due to the extremely small quantities of the K40 isotope, identifying this isotope takes an extremely sensitive and stable detection system. Not only does it have to detect this extremely small quantity of the K40 isotope, it must also be capable of blanking out inherent background radiation. Combined with the requirement to provide rock-solid, superior measurement stability, accurate Potassium content measurements are a challenge for any process meter.

Berthold Technologies has the solution for this difficult measurement. The LB 444K Potassium Meter employs a variety of highly sensitive, scintillation based density detectors to do the job. Berthold Technologies can not only detect the K40 isotope tuning it into a meaningful Potassium measurement, the system discriminates between the detected signal (of the K40 isotope) and the inherent background radiation. By doing this, any undue influence on the K40 measurement is eliminated. As this is a detection system only, there is no need for a radiometric source—the process ores itself generates the small amount of radioactivity needed for measurement of the KCL. The detection system does not contact the process — which virtually eliminates maintenance and costly downtime.

An easy to use electronics interface (evaluation unit) provides real time measurement readouts in % KCL. A 4-20 mA output is also provided for use by any DCS/PLC computer.

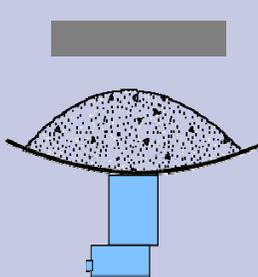
LB 444K Potassium Content Measurement

As with any detection system, having a highly sensitive, stable and rugged detector is essential to making an accurate measurement. The LB 444K uses two types of detectors dictated by the process parameters. When maximum sensitivity is required, Berthold Technologies' SuperSENS detector is used. Due to its large scintillation crystal (150mmX150mm) the SuperSENS is the solution where maximum sensitivity is required. Berthold Technologies 50mmX50mm Thallium -doped Sodium Iodide detector (which is 3.67 times more sensitive than standard PVT crystal material) is used for applications where less sensitivity is needed.

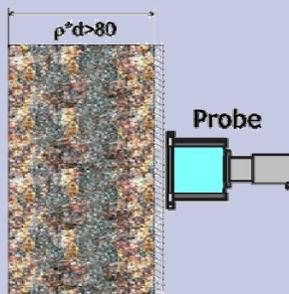
Three different mounting configurations can be accommodated. In **belt conveyor applications**, the detector can be placed under the conveyor belt. For **surface mount applications**, approximately 800 mm of process (corresponding to area weight >100g/cm²) is required so enough K40 isotope is present. Surface mount configurations can also be on a large pipe with brine. For applications requiring **insertion dip tubes** in vessels, the rugged 50X50mm detector can be used. As with surface mount configurations, a minimum of 800mm of process material is required (corresponding to area weight >100g/cm²).

Even with the extremely small amounts of the K40 isotope, the LB 444K can achieve the following accuracies:

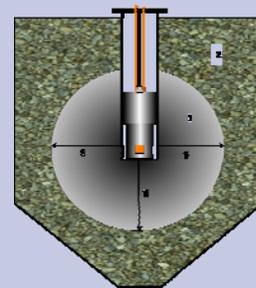
- Surface Mount probe-approximately +/-0.05% K2O
- Insertion into dip tube- approximately +/-0.065% K2O
- Belt conveyor mounting -. 05-0.7% belt load dependent



Belt conveyor mounting



Surface mount probe



Insertion into dip tube



Graphical representation of an LB 444K system using a SuperSENS detector mounted on a vessel wall. The detector is mounted against the side wall while the LB 444K evaluation unit is mounted remotely. Two wire digital communication is used -giving the operator the capability of performing predictive maintenance by monitoring temperature, High Voltage and other parameters. Having a readout which displays in % KCL makes the system easy to operate. A 4-20 mA output is available for use by a DCS/PLC.

LB 5430 SuperSENS Detector

Weight approx. 100 pounds (45 kg)
 Weight with cooling system- 119 pounds (54 kg)
 Crystal Material-Polymer
 Housing material—Stainless Steel (ISO 1.4301/AISI 404)
 Ambient temperature (-40 to +55C) -40 to +131F
 Temperature stability-<0.01%/deg C (-20 to +50C
 IP protection-IP 65
 Approvals-ATEX*



*Contact Berthold Technologies for specific approvals

LB 444 Evaluation Unit

Power Supply-115VAC;+/- 10%..60 Hz, 30 VA
 24VDC, (18-32 VDC)30W, 24 VAC, +/- 10%/15%, 50..60 Hz, 30 VA
 Ambient Temperature-Operation-0 to 50 deg (-40+122 deg F)
 Storage Temperature-0...+70 deg C (-40+158 deg F)
 Maximum cable length (with Berthold ID32024)- 1000 meters
 Design—19 inch module 3 HE, 21 TE, protection class IP 20
 Installation-19 inch frame (max 4 modules) wall housing (max 2 modules) or switchboard



Direct readout in % KCL

LB 4430 Sodium Iodide Detector

Weight approx. 40 pounds (18 kg)
 Weight with cooling system- 45 pounds (20 kg)
 Crystal Material- Sodium Iodide - NaI (Ti)
 Housing material—Stainless Steel (ISO 1.4301/AISI 404)
 Ambient temperature -40 to +60C
 Temperature stability-<0.002%/deg C (-20 to +50C)
 IP protection-IP 65
 Approvals-ATEX, FM, CSA*



*Contact Berthold Technologies for specific approvals

