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# Concentration Measurement for Dredging Applications

## Production measurement

Efficient dredging is based on the optimum ratio between the solid concentration and flow rate of the dredged material. Precise monitoring of current production is crucial for increasing yields.

The radiometric density and concentration measurement is a well-established method for gaining reliable information about the solid concentration. Mounted on the outer wall of the pipeline, BERTHOLD TECHNOLOGIES concentration measurement system provides superior and stable readings despite though environmental conditions.

In combination with a flow rate signal, the radiometric concentration measurement provides highly reliable information about current production. The measuring results can be used for mass calculations as well.

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## Measuring System LB 444

The radiometric measuring system LB 444 from BERTHOLD TECHNOLOGIES is used for online monitoring of the solid concentration. Extreme measuring conditions like vibration, weather or varying particle size and composition don't effect the measuring performance. Due to the sophisticated stabilization of the detector performance, the highly accurate measuring results are guaranteed for many years of operation and no maintenance is required at any time.

With thousands of systems in operation worldwide, the LB 444 has proven to be a reliable measuring solution for dredging applications, providing high levels of accuracy and operational safety.



Depending on the requirements and operating conditions, different detectors are used:

### Nal-Point detector

This detector is typically used for pipeline diameters of up to 500mm. Due to the compact design it is particularly suitable for dredgers with restricted space. The scintillation crystal has a detector sensitivity, which is 20 times higher than gas filled detectors (like GM-tubes or ion chambers). The advantages of the high sensitivity are:

- excellent measuring accuracy
- significant reduction of source activity

Nal - Point detector

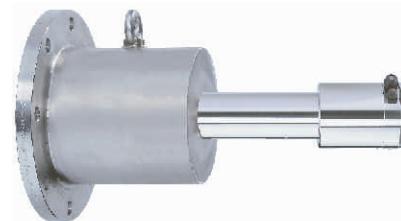


### Super-Sens detector

Being the most sensitive detector on the market, the Super-Sens impresses with its superior measuring accuracy. In many cases the source size can be reduced by 80%, depending on the measuring conditions. Therefore safety regulations can be realized easily with minimum effort.

For dredgers with pipeline diameters larger than 500mm the use of a Super-Sens detector is advisable, since alternate detectors would require unacceptably high source activities.

Super-Sens detector



*Existing sources can be used considerably longer when the Super-Sens is installed. Contact us for more information!*



# Concentration Measurement for Dredging Applications



## Installation and Start-Up

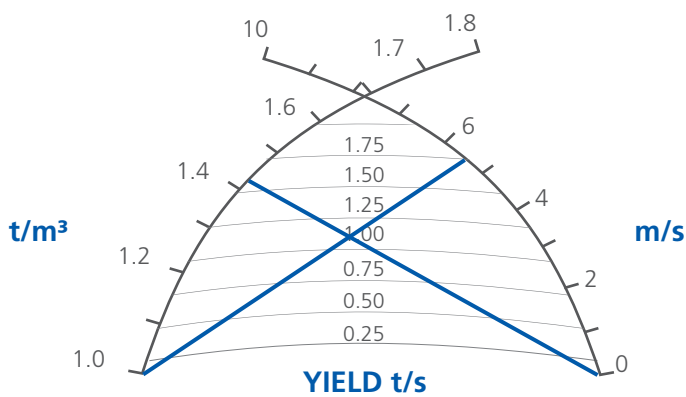
Detector and source are mounted on the outer wall of the pipeline. A specific clamping device is used to install the equipment on the pipeline. Therefore, pipeline modifications are not necessary.

The user-friendly software makes start-up easy, and guarantees easy operation and calibration procedures.

## Highest operational safety

The source is sealed safely in a compact shielding made from Lead, Tungsten or Stainless Steel.

As an option the shielding can be equipped with a pneumatic shutter mechanism, which automatically closes the radiation path when the dredge breaks down or the pipeline runs empty (e.g. due to a power cut).



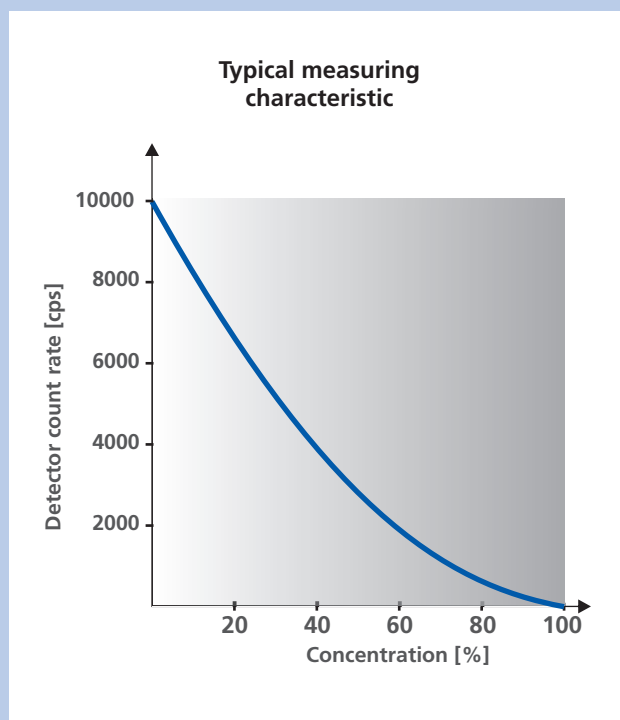
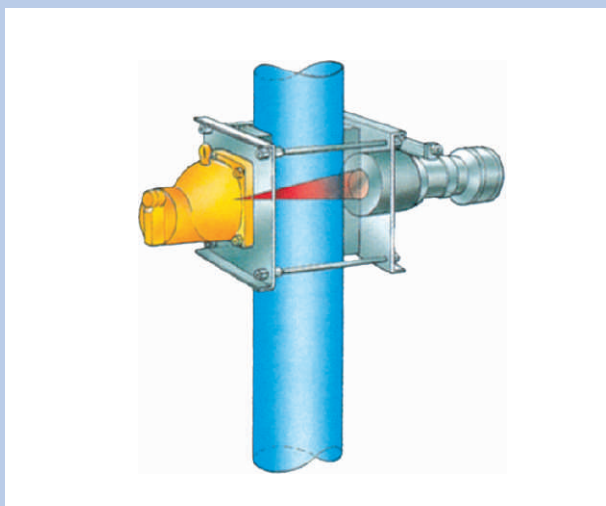
cross needle indicator

## Efficient Dredging

To obtain information about current production the concentration measurement has to be combined with a separate flow rate meter. Both measuring signals are displayed in a cross needle indicator. The cross-point of the two needles shows the current yield. Considering the specific gravity of solids and water, the measurement can also be used to calculate the solids production of the dredger.

## Measuring Principle

Gamma radiation, emitted by the source is attenuated as it passes through the pipeline. At the opposite side of the pipeline a scintillation counter measures the intensity of the radiation. As wall-thickness and measuring path are constant, the attenuation of the gamma rays is only influenced by the density or the concentration of the measured product.



Each gamma ray hitting the detector generates light flashes within the high sensitive scintillation crystal. A Photomultiplier tube is used to convert the light flashes into electrical pulses.

The number of pulses - called count rate - is directly proportional to the concentration. The higher the count rate, the more gamma rays arrive on the detector's side, which is due to a low solids concentration.

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## Highlights

- **Highly accurate and repeatable**

The high-sensitive scintillation detectors achieve a significantly increased accuracy compared to ion chambers or Geiger-Mueller tubes.

- **Always at your service**

With a worldwide network of engineers and service technicians, BERTHOLD TECHNOLOGIES is capable of supporting projects locally and around the world. Our qualified personnel will be at your site in no time at all.

- **Lowest source sizes**

Our detectors work with remarkably low source activities. Depending on the measuring conditions and system configuration, the activity can be reduced by 80%.

- **Patented detector stabilization**

Neither temperature nor aging of the electro-mechanical components affects the measuring performance. The highly reliable measurement is guaranteed during the entire operation.

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