On-Line Coke Moisture Meter

Evaluation Unit
LB 350

Coke is used in a blast furnace or a sinter plant for heating and reduction of iron ore. The quality of the process relies on relation between dry mass of coke and iron. The neutron moisture measurement determines the water content in coke.

Principle of Measurement:
A neutron source emits neutrons, which will be converted to "slow" neutrons, when they impact on hydrogen atoms. The amount of backscattered "slow" neutrons are proportional to the coke moisture.
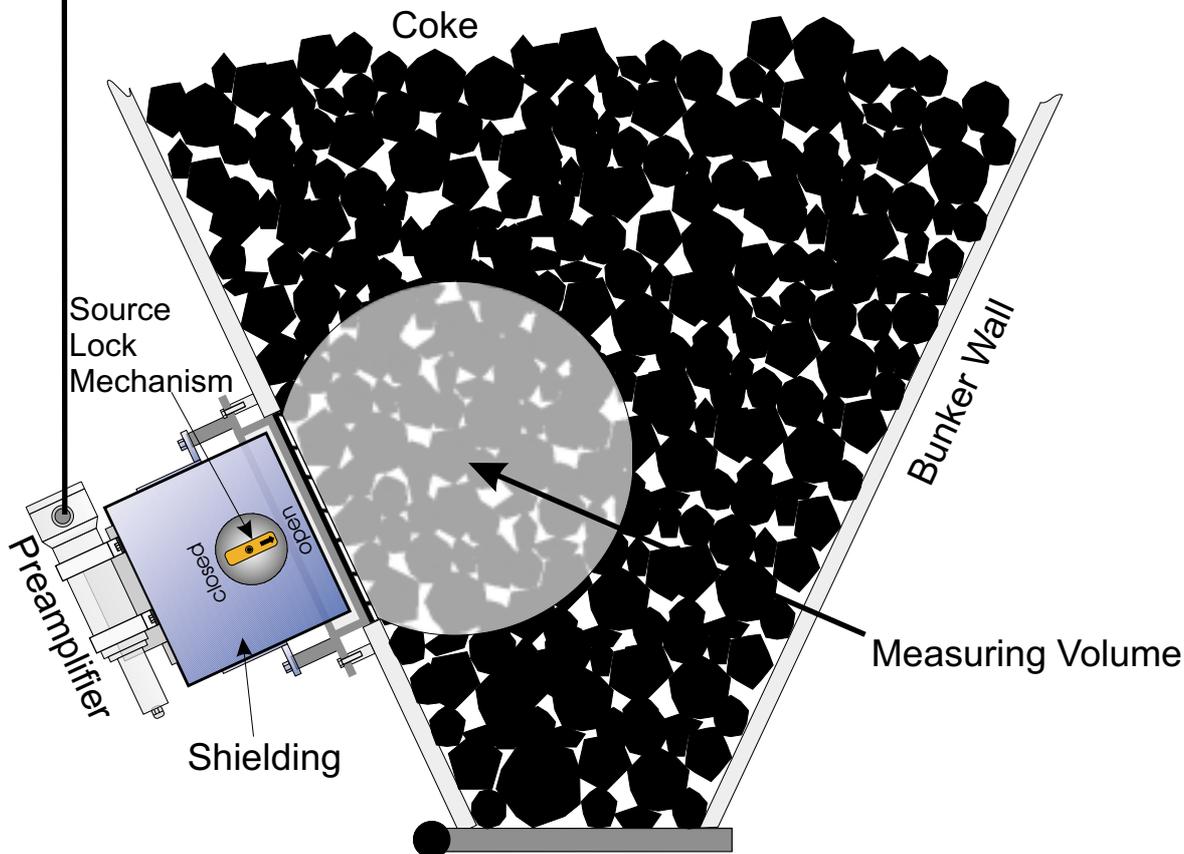*Benefit:*   *- high accuracy*
                 - very good reproducibility
                 - large measuring volume means
                    representative measurement results

The measurement can be installed at, or into the bunker wall.
Benefit*:*   ***- simple to retrofit even on existing bunkers***

The source can be shielded with a turn lock mechanism.
Benefit: *- easy handling*
                 - improved radiation protection

Coke

Source Lock Mechanism

Preamplifier

closed

open

Shielding

Bunker Wall

Measuring Volume

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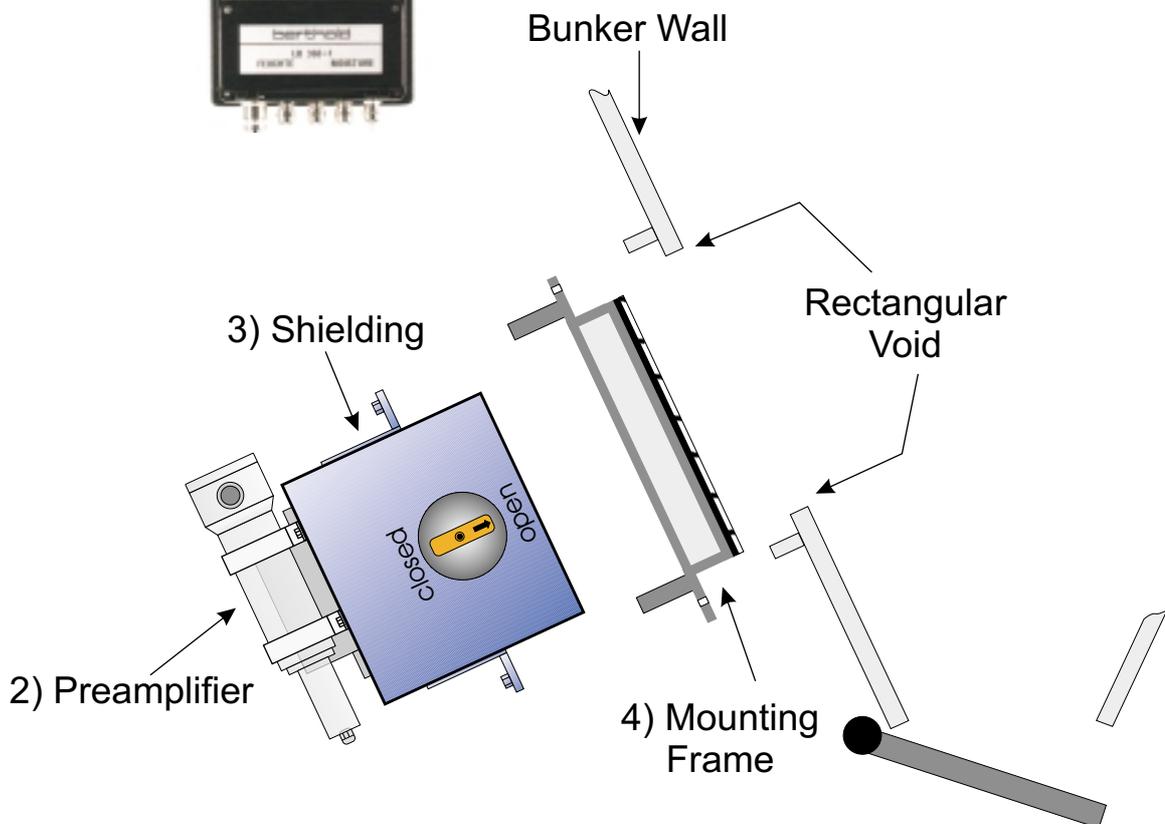# On-Line Coke Moisture Meter

Components

The moisture measurement consists of:
1) Evaluation Unit LB 350
2) Preamplifier LB 2018
3) Shielding LB 7410 with neutron source and 2 counter tubes
4) Mounting frame
For the mounting frame a rectangular void is cut into the bunker wall. The mounting frame is assembled into this void. The shielding with the preamplifier is screwed on the mounting frame.
The 7-core cable between evaluation unit and preamplifier is used for signal transmission and power supply to the amplifier.
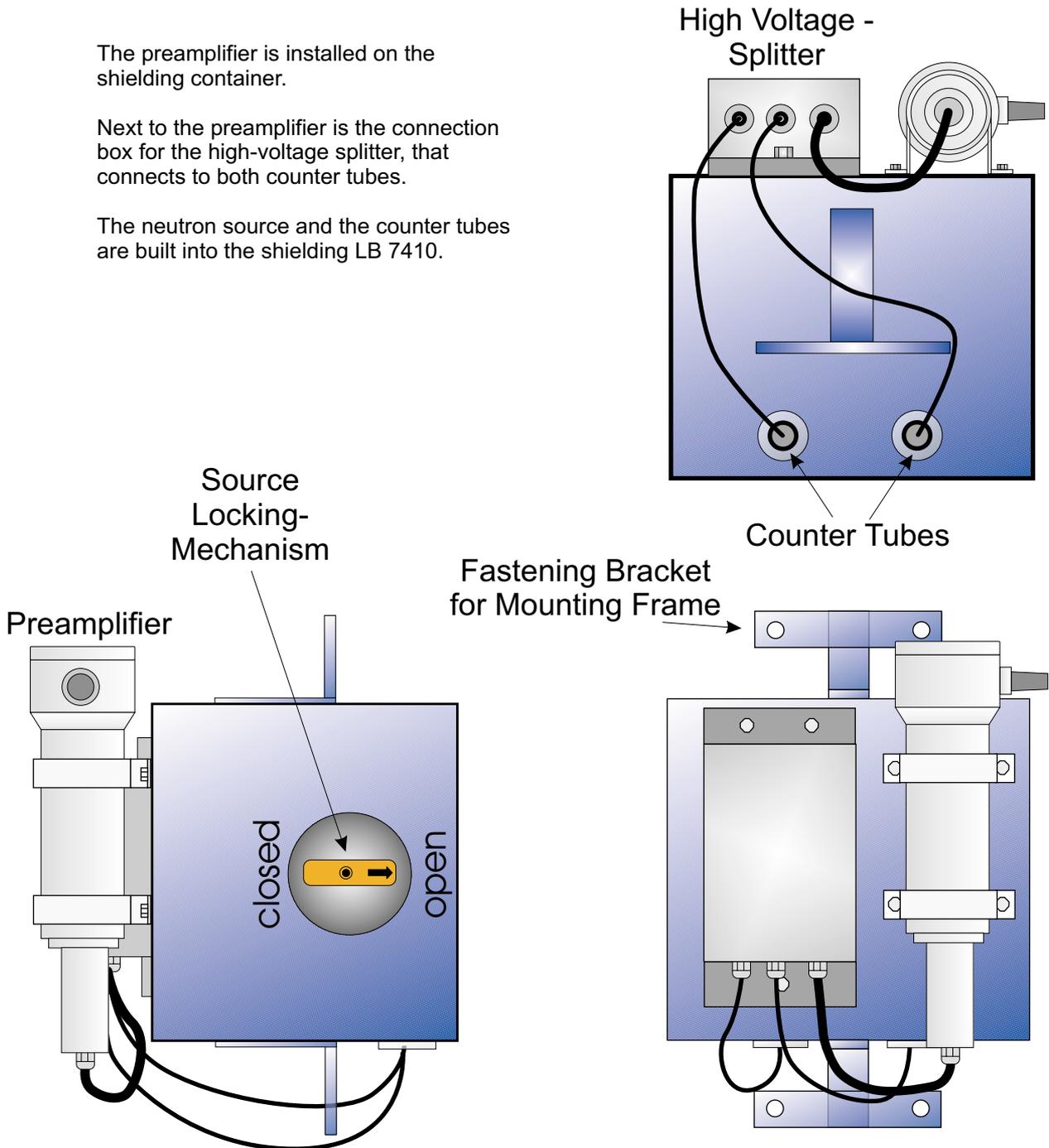

1) Evaluation Unit LB 350

Bunker Wall

3) Shielding

Rectangular Void

2) Preamplifier

4) Mounting Frame

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Shielding LB 7410

The preamplifier is installed on the shielding container.

Next to the preamplifier is the connection box for the high-voltage splitter, that connects to both counter tubes.

The neutron source and the counter tubes are built into the shielding LB 7410.

High Voltage - Splitter

Counter Tubes

Source Locking- Mechanism

Preamplifier

closed   open

Fastening Bracket for Mounting Frame

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3

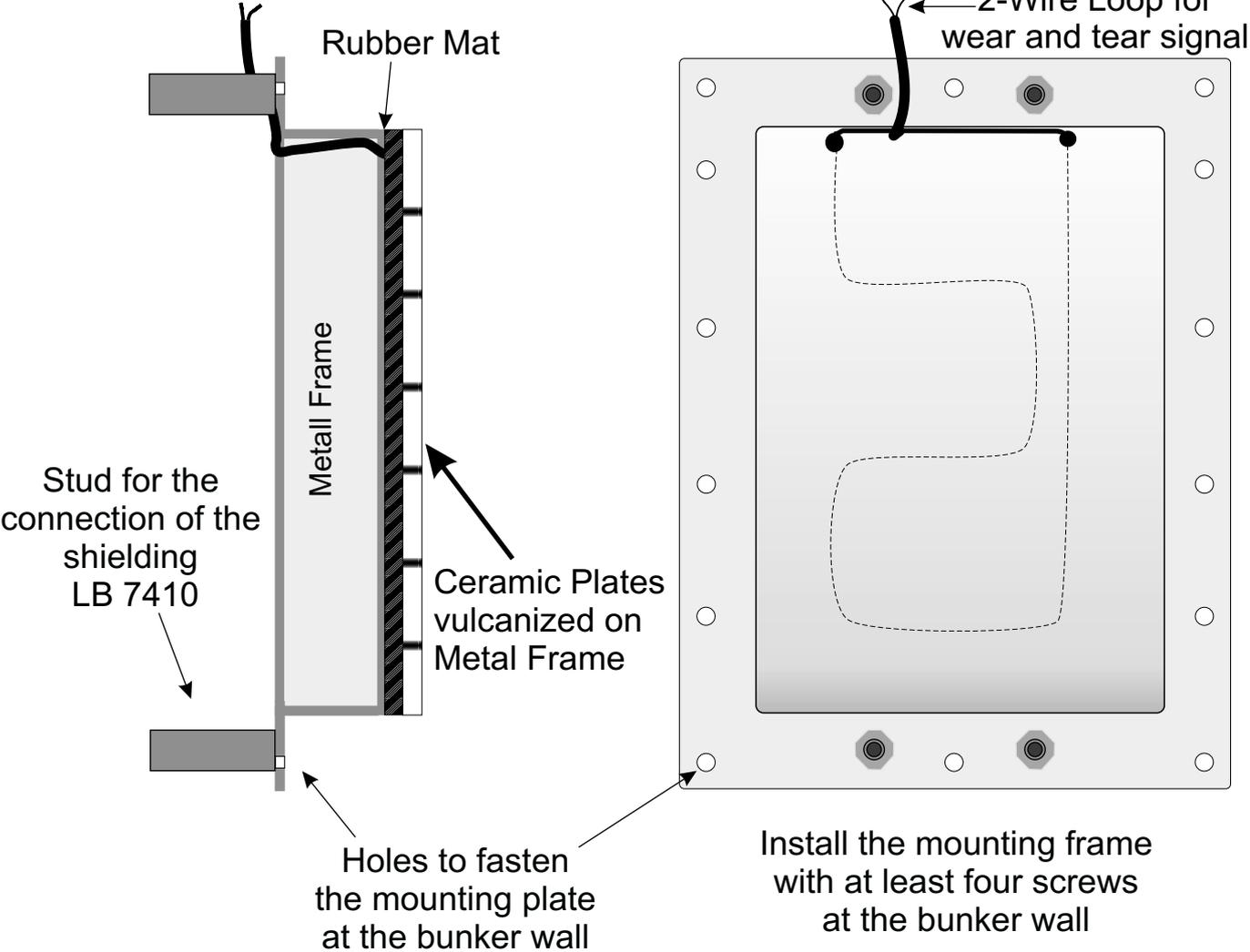# On-Line Coke Moisture Meter

Mounting Frame

The mounting frame consists of a rubber mat, glued on a metal frame. Small wear resistant ceramic plates are vulcanised on the rubber mat.

To indicate a wear and tear signal, a wire loop is located between the metal frame and the rubber mat.

Cross Section

Rubber Mat

Metall Frame

Stud for the connection of the shielding LB 7410

Ceramic Plates vulcanized on Metal Frame

Holes to fasten the mounting plate at the bunker wall

Back Side

2-Wire Loop for wear and tear signal

Install the mounting frame with at least four screws at the bunker wall

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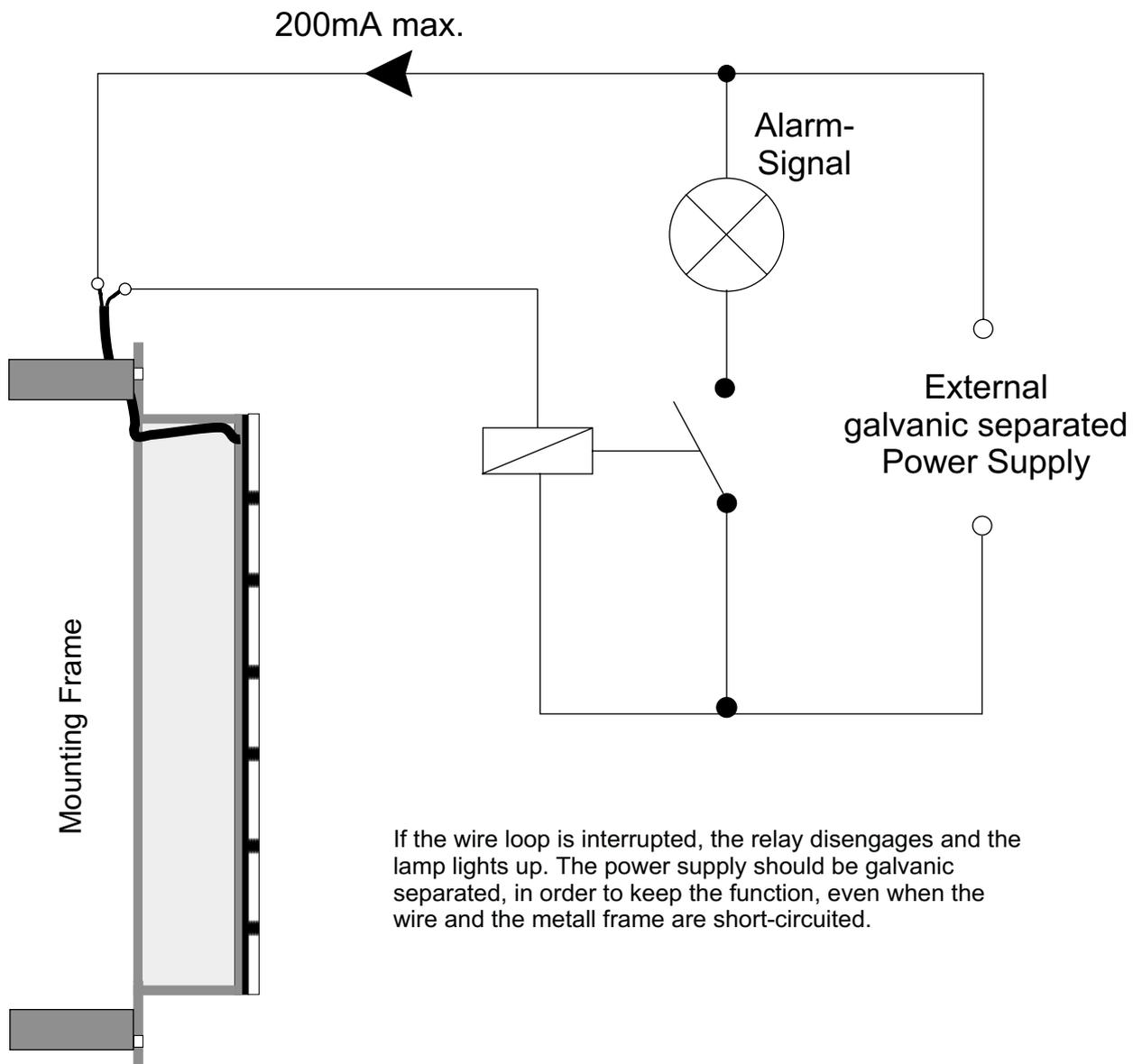# On-Line Coke Moisture Meter

Wear and Tear Signal

The wire loop can be connected electrically as a wear and tear signal.

Benefit: - **timely warning for the exchange of the mounting frame**
- **additional safety for the** shielding

LB 7410
The following figure shows a wiring example. Alternatively the wire loop can be connected direct to the input of a process control system, to get an error message indicated.

200mA max.

Alarm-Signal

External galvanic separated Power Supply

Mounting Frame

If the wire loop is interrupted, the relay disengages and the lamp lights up. The power supply should be galvanic separated, in order to keep the function, even when the wire and the metall frame are short-circuited.
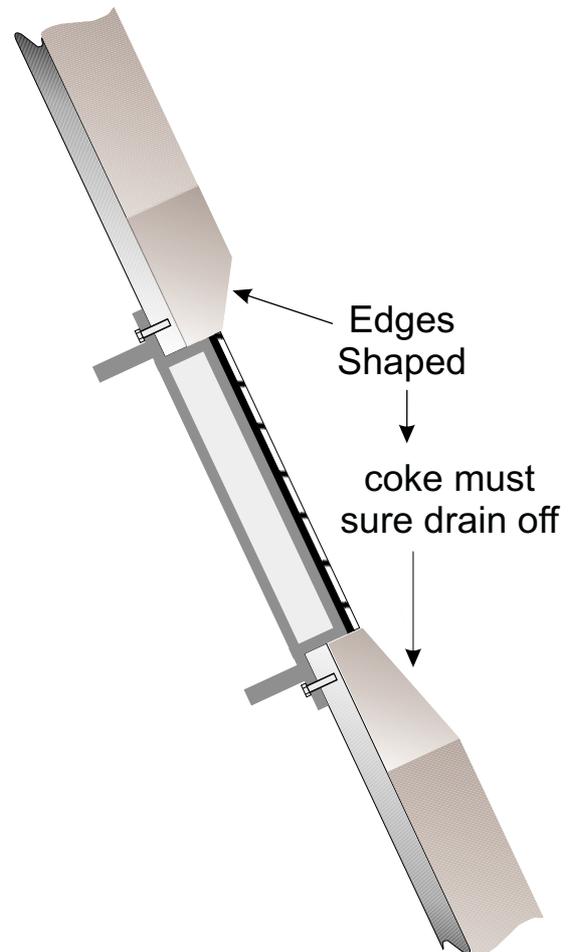
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On-Line Coke Moisture Meter

Installation

The surface of the ceramic plates is mounted flush with the inside wall.
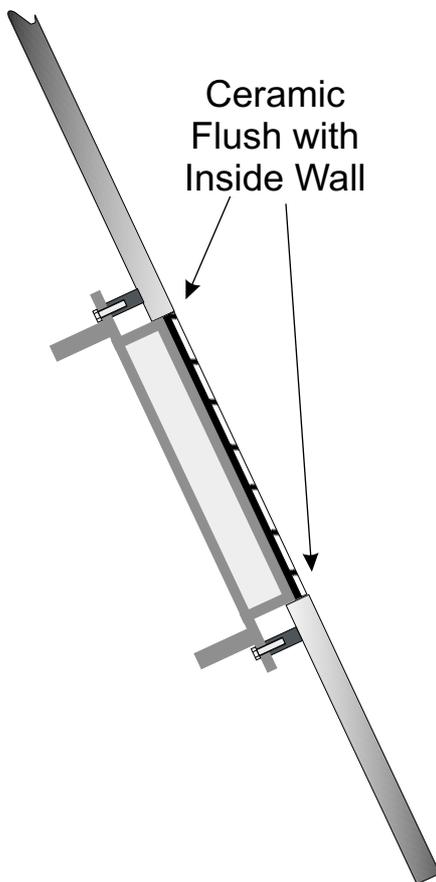
If there is a thick stone lining inside the bunker, the edges must be shaped. Ensure that no built-ups remain after emptying the hopper.

Ceramic
Flush with
Inside Wall

Edges
Shaped

coke must
sure drain off

If the bunker wall is thin, the shielding LB 7410 can be installed directly on the surface of the bunker wall and a mounting frame and rectangular void are not necessary.

Benefit: *- easy and quick installation*
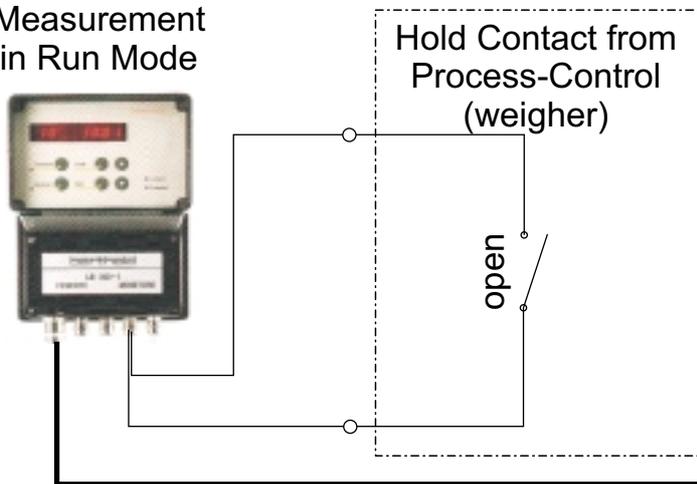   *- Installation during process possible*

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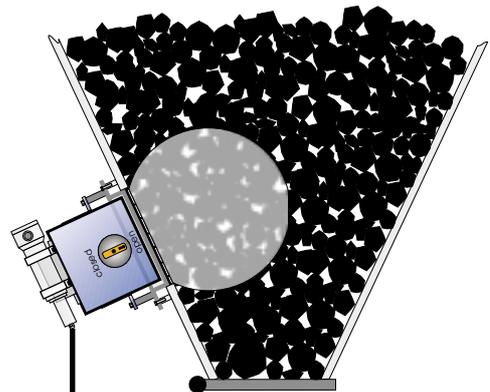# On-Line Coke Moisture Meter

Batch Mode

In a batch mode, e.g. loading hoppers for blast furnace, it is desirable to adjust the cycle so that the time the hopper stays full is maximized (>1-2 minutes). This allows the measurement to integrate on an accurate value. To make sure that the measurement doesn't have to built up from an empty hopper moisture value, the hold input of the LB350 should be connected to a maximum limit switch in the process control or weighing system.

The "hold signal" freezes the measurement before the weighing hopper will be emptied and as long as it is empty. If the weighing hopper again is full, the measurement can start from the last stored value. Due to the small moisture changes between the batches, the measurement needs only a short time to determine the new measurement value.
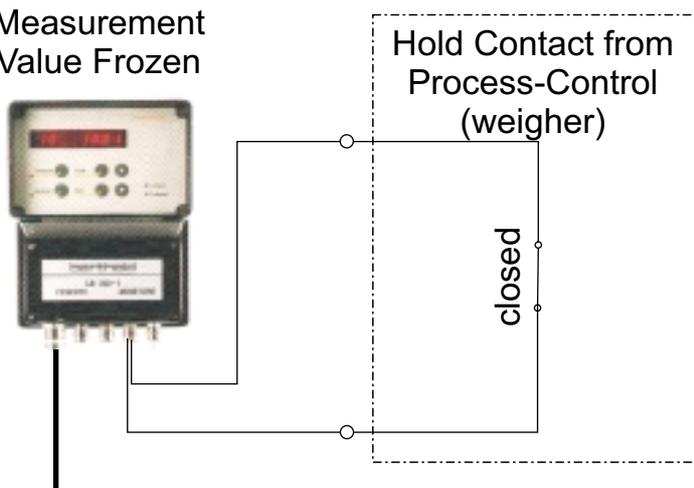
Measurement in Run Mode

Hold Contact from Process-Control (weigher)

open

Hopper Full

Measurement Value Frozen

Hold Contact from Process-Control (weigher)

closed

Hopper emptying