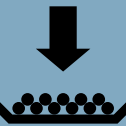


# Bulk Flow Meter

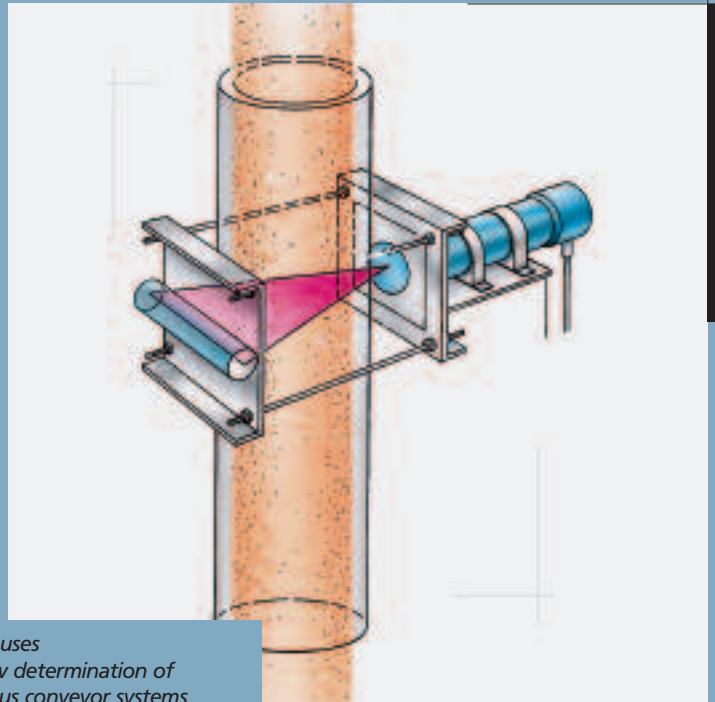
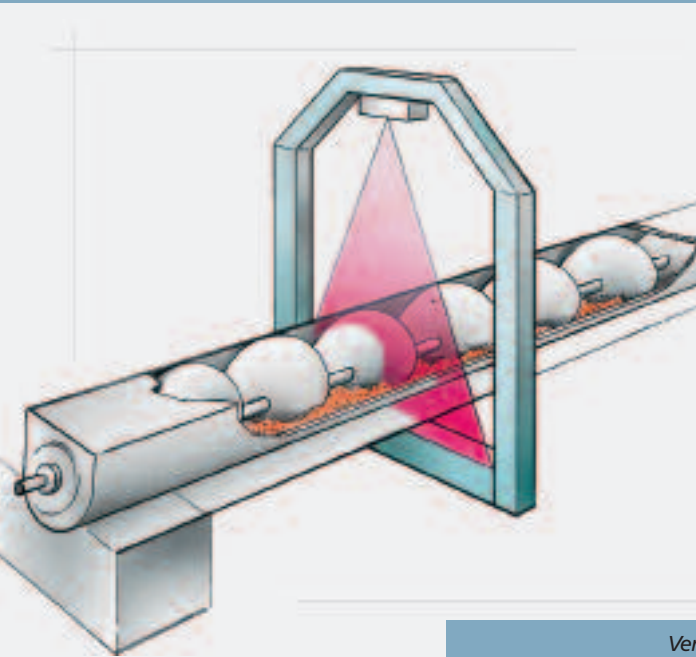
LB 442

P R O C E S S C O N T R O L

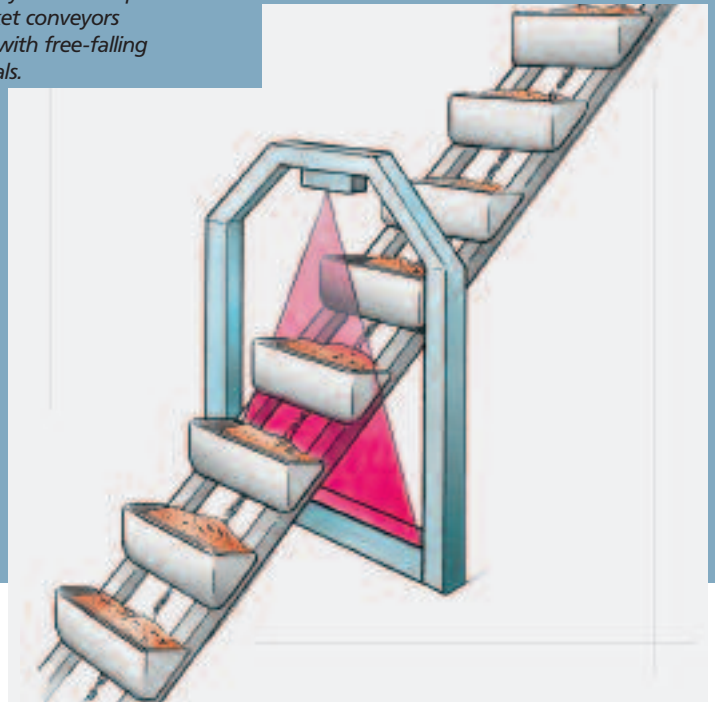
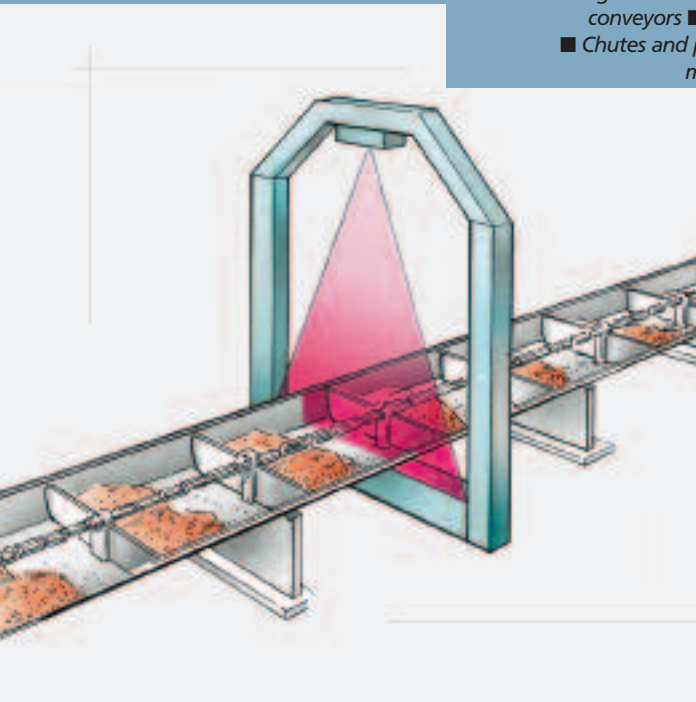


**BERTHOLD**  
TECHNOLOGIES

# Mass flow determination using the LB 442



- Versatile uses
- Contactless mass flow determination of solid matter on continuous conveyor systems
  - Conveyor belts ■ Screw conveyors
  - Troughed chain conveyors ■ Steel plate conveyors
  - Bucket conveyors
  - Chutes and pipes with free-falling materials.



# The overriding advantages

## Optimum radiation protection

The gamma source is made up of radioactive material, which is encapsulated in a stainless steel tube. A lead-filled shielding container encloses the radiation source which has been tested in accordance with ISO 2919. The radiation exit of the shielding container can be closed and locked.

## New detectors use two-wire techniques

with interference-free data transmission using FSK modulation The NaI crystal of the scintillation counter converts the absorbed radiation into photoflashes. The crystal is optically linked to a photo multiplier which, together with the detector electronics, converts the photoflashes into electrical pulses. The detector signal is transmitted to the evaluation unit by a two-wire circuit using FSK modulation. In this way, the entire system facilitates a high degree of interference-free operation. Scintillation counters have greater sensitivity than gas-filled ionisation chambers. The required source activity can be reduced by a factor of ten. The NaI crystal detector affords high temperature stability and drift-free operation. The internal microprocessor controls the „intelligent“ detector.

## What is the LB 442 evaluation unit?

The LB 442 evaluation unit incorporates state of the art technology with a 32 Bit processor for high computing speed and high precision ■ Compact design (up to 4 units can be mounted in a single 19"rack or individual units can be fitted in a wall mounted housing) ■ Illuminated 4 line LCD Display ■ 6 membrane keys for easy operation ■ Menu-driven user interface with dialogue in several languages ■ Data storage without the need for batteries by storing all calibration data in Flash-Memory

## Easy calibration

Simple calibration can be performed by using theoretical coefficients. Maximum precision is achieved by means of comparative weighing using a calibrated weighing system, e.g. a weigh bridge.

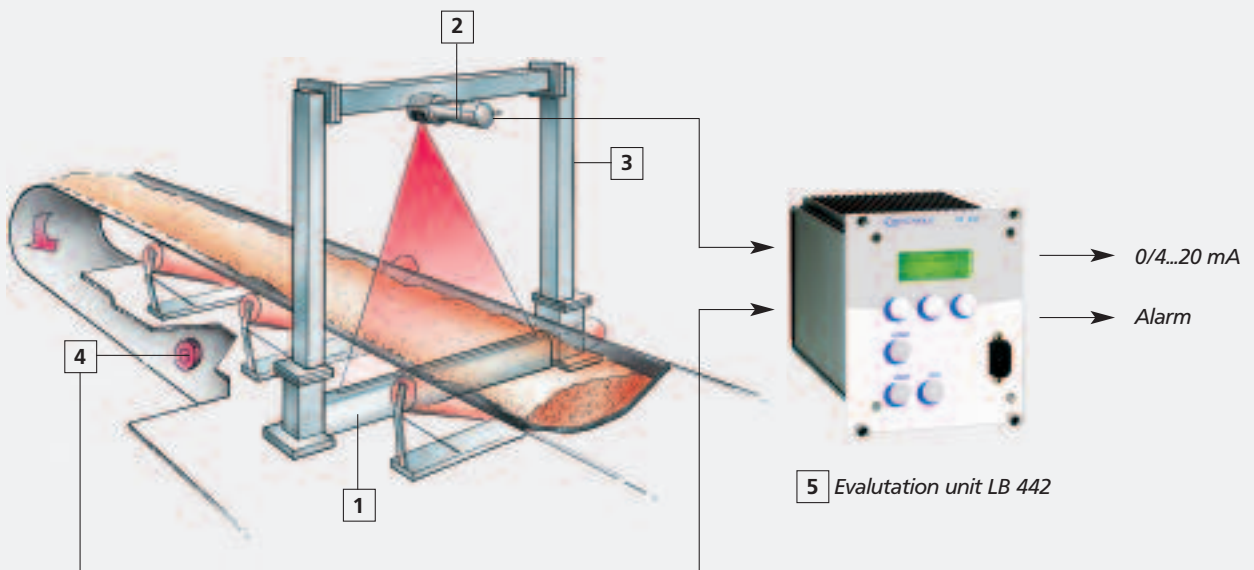
## Calibration procedures:

1. Tare measurement 2. Comparative weighings using a calibrated weighing system. The evaluation unit calculates the calibration coefficients using the above data. In practice, the accuracy obtained depends on the averaging period and the accuracy of the calibration method. Calibration can be checked using a standard absorber on the detector.

### Engineering data

To make our quotation the following technical data are necessary:

- the type and profile of the conveyor system
- typical mass flow rate (min./max./normal)
- the product being conveyed, particle size
- typical loading depth
- product speed (min./max./normal)
- required accuracy



### Schematic representation of the measuring arrangement on a conveyor belt

- 1 Shielding with rod source
- 2 Scintillation counter
- 3 Assembly and shielding frame
- 4 Tachometer
- 5 LB 442 evaluation unit

### How does the LB 442 operate?

The rod-shaped radiation source is specially designed for the application as regards loading, material and the conveyor system. The radiation source is installed in a lockable shielding which is mounted under the conveyor. The scintillation counter is installed on top of the conveyor and is in line with the radiation source. The intensity of the radiation received by the scintillation counter is a measure of the loading on the conveyor system.

The evaluation unit calculates the mass flow rate based on the detector signal and the belt speed input from the tachometer. The choice of radiation source depends on the material loading:

- for high belt loading:  $^{60}\text{Co}$  is used
- for medium belt loading:  $^{137}\text{Cs}$  is used
- for low belt loading:  $^{241}\text{Am}$  is used

► The **LB 442** system is used for the precise mass flow determination of solid matter in a variety of conveyor systems. On many conveyor systems, the radiometric weighing system is the only suitable method for determining mass flow. The Berthold system can also be used to determine the mass flow in „free fall“ in pipes or chutes. You will find detailed information on this in our information leaflet „Free Fall

Bulk Flow Meter“. The **LB 442** provides both the flow rate as well as totalling the mass of solid matter over an individually selectable measuring range from 0-200 kg/h up to 0-10,000 t/h. With the **LB 442**, measurements can be taken directly after bunker, chute outlets or transfer systems. From fine powders to large particles weighing more than 10 kg, the **LB 442** measuring system is used worldwide.

#### Contactless measurement

The system is not influenced by fluctuations of belt tension, wind load, bumps, vibrations or other forces. The measuring system is resistant to wear and tear and does not require regular maintenance.

#### No recalibration necessary

Temperature fluctuations or other environmental factors have no effect on the measuring system.

#### Long-term stability

is guaranteed by automatic drift and source decay compensation

#### High level of repeatability

Easy testing of the measuring system by incorporating a standard absorber on the detector.

#### Low source activity

through the use of highly sensitive scintillation counters

**Modest expenditure on cabling** Simultaneous transmission of measuring data and supply voltage between the detector and the evaluation unit using a two-wire technique.

#### Immunity to interference

Data transmission between the detector and the evaluation unit by FSK modulation (Frequency Shift Keying).

#### Applications

- the chemical industry - e.g. plastic granules, artificial fertilisers
- the paper and pulp industry - e.g. wood chips, blocks of wood, wood pulp
- the mining industry - e.g. coal, ore
- the mineral industry - e.g. sand, gravel
- the foodstuff industry - e.g. potatoes, potato chips, cornflakes



# Technical Data LB 442

## Evaluation Unit LB 442

Design	19" module 3 HE, 21 TE protection class IP 20
Weight	approx. 2 kg
Power Supply	115/230 V AC $\pm$ 10 % 50 - 60 Hz alternatively 18 - 32 V DC or 24 V AC +10 % -15 %
Power Consumption	ca. 30 VA (AC), 30 W (DC)
Operating Temp.	0 ... +50 °C (32 ... 122 °F) no condensation
Storage Temp.	-40 ... +70 °C (-40 ... 158 °F) no condensation
Arrangements	- in a panel - in wall mounted housing (max. 2 units) - in a 19" Rack 3 HE, 84 TE (max. 4 units)
CPU	- data protection with flash memory - self control with watch-dog-timer
Dialog	English, German, French

## Input - Output

3 Digital-Inputs	DI 1: belt stop, batch start, reset totalizer DI 2: external tare, print start, product 3/4, start-stop+print DI 3: product 1/2
3 Digital Outputs	DO 1: failure message DO 2: external totalizer DO 3: min/max, batch ready, tare maximum load (non inductive): AC: max. 250 V, max. 1 A, max. 200 VA DC: max. 300 V, max. 1 A, max. 60 W
Relay Contacts:	
Current Output	for mass flow in t/h, kg/h 0/4 - 20 mA, isolated, max. 500 $\Omega$
Current Input	for speed or moisture signal 0/4 - 20 mA, isolated, 50 $\Omega$
RS 232	for parameter print out or measurement value print out
RS 485	for max. 8 probes or measurement value print out
Probe connection	[Ex ib] IIB [Ex ib] IIC (option)

## Probes

Housing	stainless steel, IP65	
Cable Entry	M 16	M 12
Cable Diameter	5 ... 10 mm	4 ... 7 mm
Cable	LiYY or LiYCY 2x1 mm <sup>2</sup>	
Maximum Length	with BERTHOLD cable IDTNR 32024	
	EEx ib IIB	EEX ib IIC
	1000 m	250 m

## Explosion-Proof

ATEX	⊕ II 2G EEx de IIC T6 ⊕ II 2G EEx ib d IIC T6
Dust-Ex (option)	⊕ II 2D IP65 T 80 °C
FM (option)	Class I Division 1 Group A, B, C, D Class II Division 1 Group E, F, G temperature class T6 (85 °C)

## Point Detectors

Scintillation Counter	Nal (TI) crystal with automatic drift compensation
Temperature Stability	$\pm$ 0,1 % (at -20 ... +50 °C)
Operating Temp.	-40 ... +60 °C (-40 ... 140 °F)
Water Cooling	available as option
Storage Temp.	-40 ... +60 °C (-40 ... 140 °F)

## Rod Detectors

Scintillation Counter	plastic scintillator with automatic drift compensation
Scintillator-Length	500, 750, 1000, 1250, 1500, 2000 mm
Temperature-Stability	$\pm$ 0,5 % (at -20 ... +50 °C)
Operating and Storage Temp.	-40 ... +55 °C (-40 ... 131 °F)
Water Cooling	available as option
Typical dose rate at empty conveyor:	3 $\mu$ Sv/h

## Measuring Frames

Dimensions	for belt width 500 to 2800 mm see „Technical Information LB 442“
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Right to implement technical improvements and/or design changes without prior notice reserved.

