Operating Instructions

BULKSCAN
Conveyor Belt Monitor

Measuring System for Volume Flow
Measurements of Bulk Goods
on Conveyor Belts

SICK | MAIHAK
Analyzers and Process Instrumentation

Contents

Notes On This Document

These operating instructions describe the BIULKSCAN measuring system designed to determine volume flow, volume, mass and center of gravity of bulk goods on conveyour belts. It contains general information on the method of measurement used, the design and function of the entire system and its components, as well as instructions for planning, assembly, installation, commissioning, maintenance and troubleshooting.

A comparison of the characteristics of the available system variants is provided to help you decide on the configuration that is best suited to your needs in the planning phase.

These operating instructions only cover standard applications that match the technical data listed. Your SICK MAIHAK representative will gladly provide you with additional information and support for special applications. We strongly advise that you contact a SICK MAIHAK specialist for consultation with regard to special applications.

Note

- Always read these operating instructions carefully before commencing work. The safety instructions and warnings must be followed at all times.
- Some system components (such as the side-channel compressor of the purge-air units) are supplied with separate user information. This information must also be read carefully.

Symbols used in this document

For quick access and reasons of clarity, important safety information is specially highlighted in these operating instructions. These symbols are provided at the points in this documentation where the relevant information is required.

Note Provides information on the features of the device or system, along with additional tips.


ATTENTION

Important

Indicates a risk of damage to the device or system components and potential functional impairments.


DANGER

Warning

Identifies potential danger for personnel, particularly due to electrical equipment or as a result of incorrect handling of the device or system components. These warnings are intended to protect you from (fatal) injuries.

Always read warnings carefully and follow them at all times!

1 Safety Instructions

1.1 Intended Use

The BULKSCAN measuring system was designed for contactless measurement of volume flow, volume, mass and center of gravity of bulk goods on conveyour belts. It must only be used in the manner intended by the manufacturer. In particular, it is important that:

- The system is operated in accordance with the technical data and specifications regarding assembly, connection, ambient, and operating conditions (see the documentation supplied, the order documents, device documents, and rating plates)
- All of the measures required to maintain the device, e.g. maintenance and inspection, transport and storage, are provided.
- The equipment is not exposed to inadmissible mechanical stress.

1.2 Authorised Personnel

Persons responsible for safety issues must ensure that:

- All work on the measuring system is carried out by qualified personnel and checked by the experts responsible.
  These persons must be qualified by virtue of their expertise (training, education, experience) or understanding of the relevant standards, specifications, accident prevention regulations, and properties of the system. It is crucial that these persons be able to identify and avoid potential hazards in good time.
  Technical experts are those persons defined in DIN VDE 0105, IEC 364, or other directly equivalent standards.
- These persons must have precise knowledge about process-specific dangers and able to document this.
- Cabling/installation may only be carried out by trained staff according to EN 60079-14 and according to national regulations.

1.3 Safety Information and Protective Measures

1.3.1 General Notes

Handling or using the device incorrectly can result in personal injury or material damage. To prevent this, absolutely observe the following points:

- The relevant legal stipulations and associated technical regulations must be observed when preparing and carrying out work on the installation. Local and plant-specific conditions as well as process-specific dangers and specifications must be observed at all times.
- The operating instructions for the measuring system and plant documentation must be available on site. The instructions for preventing danger and damage contained in these documents must be observed at all times.
- Suitable safety equipment and personal protection measures must be available in accordance with the potential hazard and must be used by the personnel.

1.3.2 Danger from Electrical Equipment

The BULKSCAN measuring system is an item of electrical equipment designed for use in industrial power installations. When working on power connections or on live components, make sure that the power supply is switched off. If necessary, replace shock protection measures before reconnecting the power supply.

1.3.3 Danger Due to Laser Beam


WARNING

The LMS laser scanners as a component of the measuring system use a laser with laser protection class 1 (eye-safe). The notes for use of this system component in the corresponding equipment documents have to be observed absolutely.

1.3.4 Preventive Measures for safe Operation

An optional purge air system is available to protect the optical system from contamination. If using this system, the operator shall ensure that:

- The power supply for the purge-air unit operates reliably and without interruption,
- A failure on the purge-air supply is detected immediately (for example, by using pressure monitors),
- Malfunctions of the purge-air supply are removed immediately.

1.3.5 Detecting Malfunctions

Any deviations from normal operation must be regarded as a serious indication of a functional impairment. These include:

- Significant drifts in the measurement results,
- Increased power consumption,
- A rise in system component temperature,
- Triggering of monitoring devices,
- Unusually strong vibrations / unusual operating noise from a purge-air fan,
- Smoke or unusual odors.

1.3.6 Preventing Damages

To prevent personal injury or damage to the system, the operator must ensure that:

- The maintenance personnel responsible can reach the site immediately, and at any time,
- The maintenance personnel is sufficiently qualified to respond to malfunctions on the BULKSCAN and any resulting malfunctions (for example, if the system is used for open or closed-loop control purposes)
- The defective equipment can be switched off immediately if necessary,
- Switching off equipment does not indirectly cause further malfunctions.

1.4 Instructions on Safeguarding

To prevent malfunctions or damages by transportation and storage it has to be made sure that:

- The measuring system only is transported into original packing and stored dryly (in no case unprotected in the open!),
- Never leave cable ends or plugs unprotected. Always insulate cable ends. When not in use, always protect cable contacts against moisture and dirt with protective covers or suitable packaging materials. Corroded contacts can cause malfunctions!

BULKSCAN

Conveyor Belt Monitor

Product Description

2 Product Description

2.1 System Characteristics and Application Range

The BUKLKSCAN system is designed for the contact-free continuous recording of the volume of bulk goods on conveyor belts. The basis for this is the principle of laser beam transit time measurement. This makes the system different to every other measuring method used for measuring bulk goods until now.

Features and benefits

- Contact-free optical determination of volume, volume flow, mass and mass flow of bulk goods using a laser scanner
- Continuous delay-free measurement
- High resolution by short time intervals between the laser impulses and high angular resolution
- Integrated determination of the center of gravity
- Calculation of volume or mass flow with summation as total mass or total volume
- Not subject to planning permission
- Simple installation
- Minimum maintenance effort
- User-friendly Windows operating program for parameterization and visualisation.

Application range

The measuring system can be used for various control, regulation and accounting tasks. The measuring system is also suitable for extreme operating conditions thanks to the robust industrial housing.

Possible areas of application include:

- Monitoring of transport equipment for conveying coal or ore, e.g. in open-cast mines or shipment plants to:
  - minimize the energy consumption, maximize the transportation performance by maximum belt load
  - prevent off-track running
- Measuring the ash removal in power plants
- Loading control of transport such as lorries, ships and freight train wagons
- Volume and mass measurement in gravel works and other operations in the building materials industry.

2.2 System Overview and Operating Principle

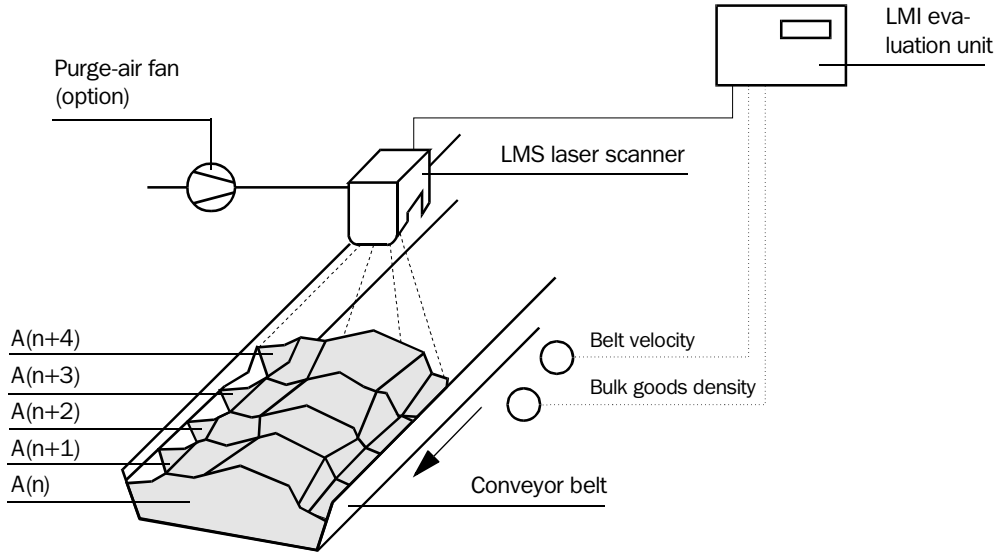
2.2.1 System Overview

The system comprises of the following components as a standard:

- LMS200 Laser scanner (Indoor) or LMS211/220 (Outdoor)
  for transmitting and receiving light pulses
- Installation parts
  for mounting the laser scanner above the conveyor belt.
- LMI Evaluation unit
  for signal processing, controlling the system functions, and signal input/output

The following components are available as options to use the system in dusty ambient air or if there is fog or vapour above the bulk material:

- Dust protection shield (for LMS211 laser scanner only)
- Dust protection outdoor in connection with a purge-air unit
  (for LMS211/221 laser scanner)
- Air knife



A: Bulk goods area of the scanned profile at the time of x

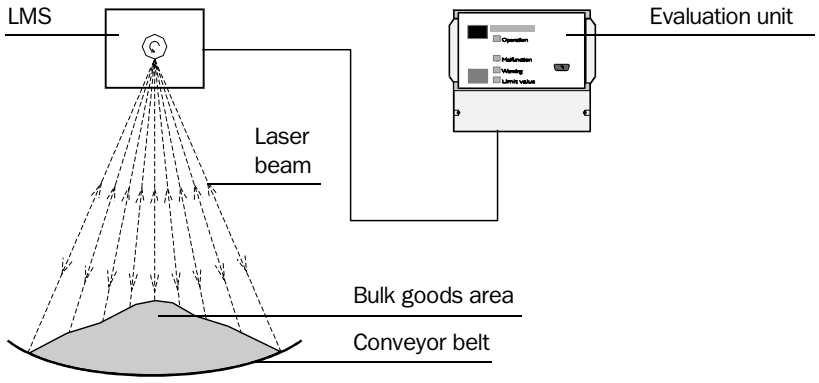
Fig. 2.1: BULKSCAN system components

2.2.2 Operating Principle

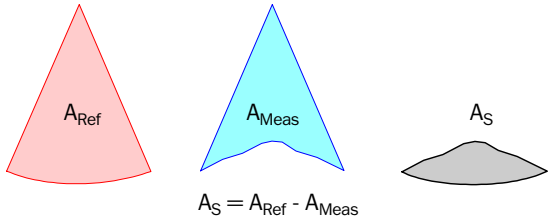
The surface contour of the bulk goods is scanned by a pulsed laser beam two-dimensionally at very short intervals of time. The laser impulses are deflected by an internal rotating mirror and reflected by the object measured (the bulk goods). The transit time of the transmitted and received impulse is used to determine the contour of the bulk goods in the scan level. By comparing this contour with the profile of the empty conveyor belt, the respective bulk goods area is calculated (see **Fig. 2.2**).

For input of the belt velocity also impulse signals can be used.

The requested output variables as well as total volume or total mass are determined using the belt velocity or bulk goods density (constant value or analog signal of an external sensor).



A_{Ref} and A_{Meas} are calculated using to the Simpson method (calculation of an integral from numeric points).



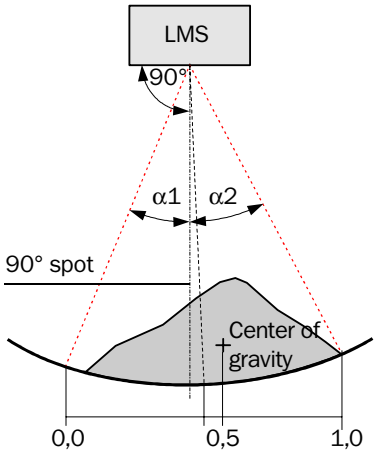
A_{Ref} : Reference area (determined during memorising the reference contour)
A_{Meas} : Area calculated from bulk goods profil data
A_S : Bulk goods area used for volume calculation

Fig. 2.2: BULKSCAN operating principle

Center of gravity calculation

In addition to the determined bulk goods profile the center of gravity is calculated from this in the evaluation unit. This allows to prevent belt off-track running caused by asymmetrical belt filling or unequal mass distribution, and protect against breakdowns.

The center of gravity is calculated in the range of 0.0 to 1.0 within the limits provided by the angles of beam $\alpha 1$ und $\alpha 2$. The angles of beam are defined by the maximum possible belt filling (see **Fig. 2.3**).



The center of gravity (value 0.5) is identical with the 90° spot of the laser beam if $\alpha 1 = \alpha 2$.

Fig. 2.3: Center of gravity calculation

The center of gravity center is provided as an analog value 0/2/4 ... 20 mA at the standard analog output or an additional analog output installed as an option (see Section *2.5.2* and *4.2.2*).

Note The center of gravity is calculated only if a defined minimum belt filling exists (adjustable per cent value of A_{Ref} , see **Fig. 2.2** and Section *4.3.5*). Till there the value 0.5 is spent on the gravity center (corresponds to 12 mA at the parameterized analog output with Live Zero set to 4 mA).

Response time

The response time t_{90} is the time taken by the measuring device to reach 90 % of the end value after a sudden change in the measured value (see **Fig. 2.4**). Setting a higher t_{90} time provides better attenuation of transient fluctuations in the measured value and interference to produce a "smoother" output signal.

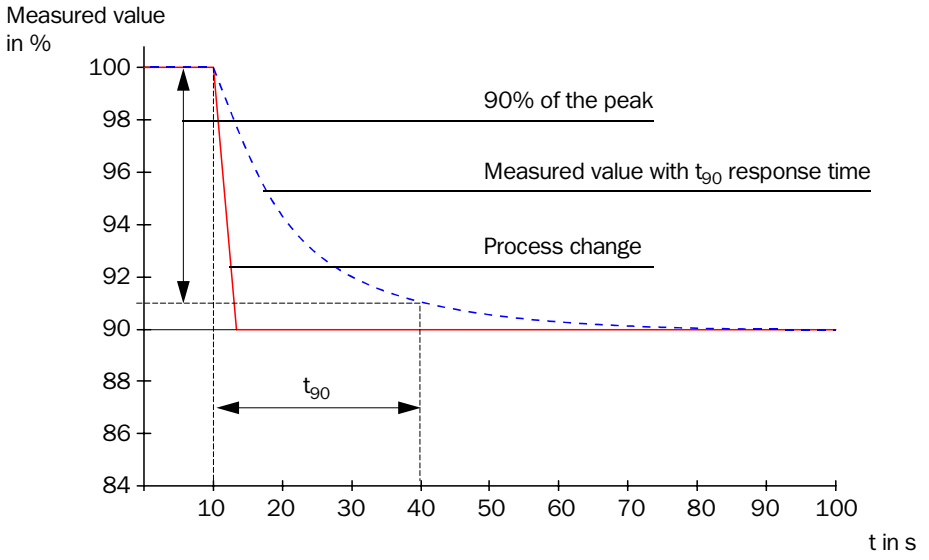


Fig. 2.4: Response time

2.3 System Components

2.3.1 LMS Laser Scanner

Details about laser scanners see separate documentation

The laser scanner is the system sensor. With the use of an internal rotating mirror laser light impulses are transmitted in an angle of beam which can be defined by using the BULKSCAN operating program. The transit time of the light signals reflected by the bulk goods or empty conveyor belt are measured in the scanner and converted into length vectors. Therefore the profile of the bulk goods can be determined across the entire angle of beam. The profile data is transferred to the evaluation unit for further calculation in digitalised form.

To obtain optimal measurement results also at different operating conditions, the following types were selected from the available laser scanners:

Feature	Scanner type		
	LMS200	**LMS211**	**LMS221**
Installation location	under roof	in the open	
Inside heating	without	with	
Scaning angle	180 °	100 °	180 °
Degree of protection	IP 65	IP 67	
Ambient temperature	0 ... +50 °C	-30 ... +50 °C	
Part no.	1029095	1029096	1029097

Common features are a shorter range, no fog correction and with that a higher measuring precision. The angular resolution can be adjusted in steps of 0.25/0.5/1 , the supply voltage is 24 V d.c..

LMS200 LMS211 (with dust protection shield) LMS221

Fig. 2.5: LMS laser scanners for BULKSCAN

2.3.2 Parts for Mounting the Laser Scanners

Installation see Chapt. 3

The laser scanner must be mounted centric over the conveyor belt using the following mounting parts at mountings or carriers which have to be provided by the customer.

Scanner type	Mounting part	Part no.
LMS200	Mounting set 1	2015623
	Mounting set 2	2015624
	Mounting set 3	2015625
LMS211/221	Mounting set for wall mounting *	2018303
	Mast attechment set (mounting set required)	2018304

*: Scope of supply

2.3.3 LMI101 Evaluation Unit

The evaluation unit is used to control the system functions, processing and calculation of the data from the laser scanner, and the signal input/output functions. The unit features an LCD for displaying the measured variables, LEDs for signaling the device status, and 2 control keys for selecting the measured variable and device status.

Moreover the exceeding of freely selectable limit values for volume, mass or bulk goods area can be indicated. This is particularly advantageous when the measuring system is used to control loading, for the prevention of overloading.

The installation and device parameters can be conveniently configured via an RS 232 port on the front panel using a laptop and user-friendly operating program. The configured parameters are also stored in the event of a power failure.

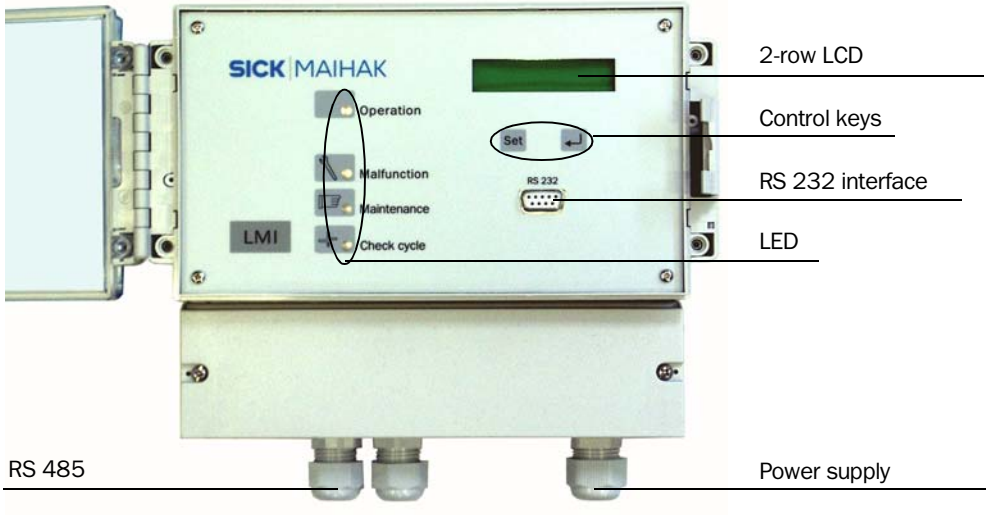


Fig. 2.6: LMI101 evaluation unit

Indication

Type		Display of
LC-Display	1th line	Measuring variable (selectable): Volume flow, mass flow, bulk goods density, center of gravity position
	2nd line	Status information
LED	Operation	trouble-free measuring
	Malfunction	Malfunction; device provides no valid measuring values
	Maintenance	Maintenance mode
	Check cycle	Device initialization (LED flashes)

Control keys

Functions	Remark
• Selecting a measuring variable • Activating the maintenance mode • Triggering a check cycle • Counter reset	You can display all of the options available by pressing the < SET > key (the display scrolls automatically if you press the key for longer than >1 s). To choose the option currently displayed, press the <↵> key.

Interfaces

Analog output 0/2/4 ... 20 mA	**Impulse output**	**Relay outputs (48 V, 1 A)**	**Serial interfaces**	**Digital inputs (potential free contact)**
Selectable output variables: • Volume flow • Mass flow • Bulk goods density • Center of gravity position	Selectable output variables: • Volume • Mass	for status signals: • Operation/Malfunction • Limit 1 • Limit 2 • Warning	• RS 232 (front panel) for external communication with the system • RS 422 (terminal strip) for communication with the laser scanner	• Input 1 for resetting the counter • Input 2 for status signal conveyor belt (on/off), or for an impulse counter e.g. of an incremental transmitter as a reference for the belt velocity. The function is determined by the choice of the signal source for the belt velocity.

Selectable output variables

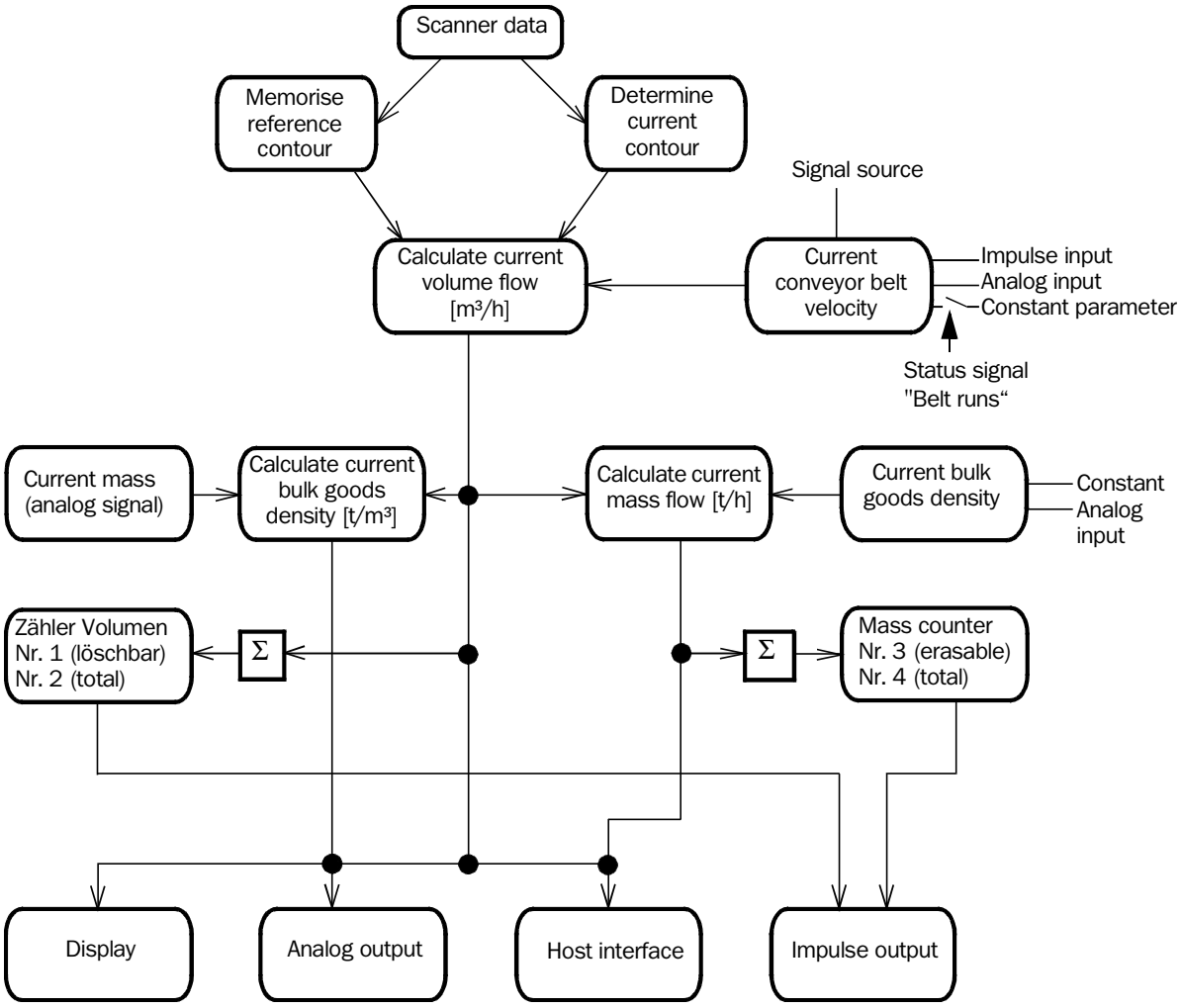


Fig. 2.7: Selectable output variables

Optional modules

The functionality can be extended using the following modules

- Analog module 0/2/4 ... 20 mA (1 or 2 pcs.)
  Optionally as an analog output for outputting a further measured variable, or as an analog input for reading the belt velocity or bulk goods density.
- Interface module
  Interface for communication (parameterization, status query, transfer of measured values) with external host computer, adjustable for RS 232, RS 422, RS 485. The output of the measuring variable on this interface and the baud rate are freely adjustable. The necessary protocol frame is provided by SICK MAIHAK on request.
- Profibus DP module
  To transmit the values measured by the BULKSCAN to a process control unit on a Profibus connection. Measured values are read every 2 s (default setting) and made available on the Profibus according to a special transfer protocol. Data will only be transmitted if at least one value has changed.

  A detailed description with information about transmission protocol and addressing is contained in a separate document provided by SICK MAIHAK on request.

Profibus DP-V0 for transmission via RS 485 according to DIN 19245-3 and IEC 61158.

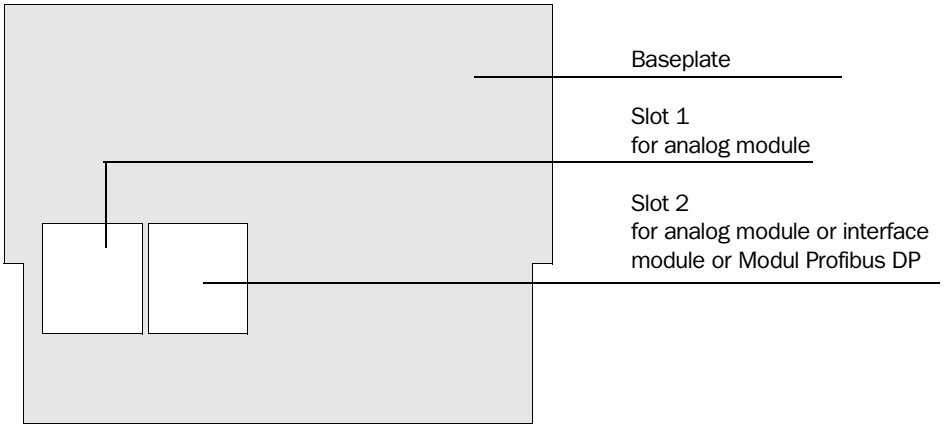


Fig. 2.8: Slots for optional modules

2.3.4 Optional Components against Dust and/or Vapour or Fog above the Bulk Goods

In particularly dusty conditions (cement works, coal shipment etc.) or when measuring bulk goods with a high proportion of dust, contamination on the front window of the laser scanner can obstruct the light path.

If the bulk goods steams (e.g. wet coal) or emits gas, the laser beam cannot detect exactly the bulk goods profile so that measuring errors appear.

We recommend in such cases to use the following accessory to extend the maintenance interval and prevent measuring problems.

Option	Use	Part no.
Dust protection shield (for LMS 211 only)	Ifdust formation in the ambient or by the bulk goods is limited for shorter periods	2017722
Dust protection out-door (for LMS 211/ 221)	At frequent till permanent dust formation; in connection with purge-air unity	7044003
Purge-air unit	For dust protection outdoor The version depends on concrete conditions at the installation location (dust load).	see Section. *2.5.4* and *2.5.5*
Airknife (on request)	For steaming/gas emitting bulk goods The version depends on concrete conditions at the installation location (e.g. conveyor belt width).	

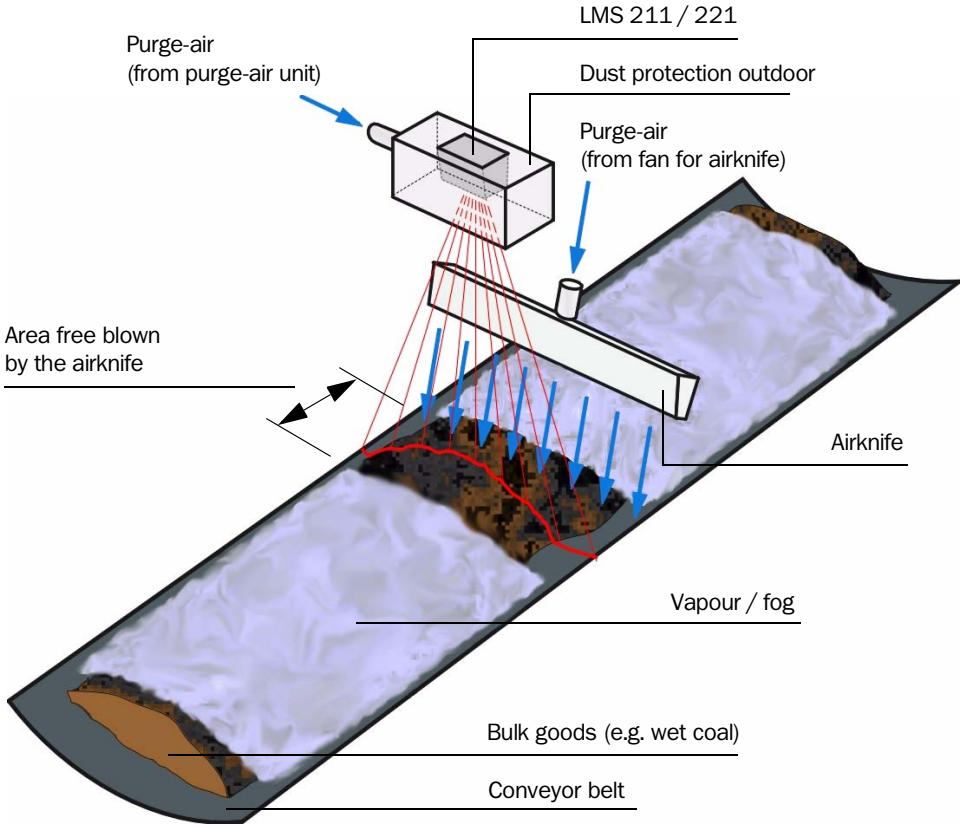


Fig. 2.9: Option components against dust and/or vapour or fog

2.4 Technical Data

Measured value acquisition			
Measured variables	Volume flow, Mass flow, bulk goods density, center of gravity		
Measuring range	freely selectable		
Typical uncertainty *	± 3 % under ideal conditions; max. ± 5 % (depending on the profile)		
Bulk goods height	minimum 200 mm		
t_{90} time	0.1 ... 300 s		
Laser scanner			
Scanner type	LMS200	LMS211	LMS221
Scan angle	180 °	100 °	180 °
Installation location	under roof	in the open	
Distance to conv. belt	≥ 0.5 m	≥ 1 m	
Heating **	without	with	
Conveyor belt width	max. 4 m		
Cable length to LMI101	max. 500 m		
Operating voltage	LMS electronics: Heating:	24 V DC • 15 % (ripple max. 500 mV) 24 V DC (ripple max. 6 V)	
Power consumption	LMS electronics: Heating:	approx. 20 W (max. 1,8 A) approx. 140 W (max. 6 A)	
Degree of protection	IP 65	IP 67	
Ambient temperature	0 ... +50 °C	-30 ... +50 °C	
Dimensions (W x H x D)	155 x 185 x 156 mm	352 x 266 x 202 mm	
Mass	4.5 kg	approx. 9 kg	
LMI101 evaluation unit			
Displays	2-row LCD	for measured variables and status messages	
	LED	for operation, malfunction, maintenance, check cycle	
Analog output	Analog output 0/2/4 ... 20 mA, max. load 750 Ω; update rate 2/s		
	Optional max. 2 analog modules 0/2/4 ... 20 mA; can be configured as input or output		
Relay outputs	for status signals operation/malfunction, limit 1, limit 2. warning; load capability 48 V, 1 A; floating		
Impulse output	Max. pulse frequency 1 kHz, pulse duration 500 µs, pulse width 0.1 - 1000 pulses per unit „closed“ 0 V ≤ UCE_L ≤ 2 V, 2 mA ≤ ICE_L ≤ 220 mA, „open“ 16 V ≤ UCE_H ≤ 30 V, 0 mA ≤ ICE_H ≤ 0.2 mA		
Digital inputs (potentialfree contact)	Input 1 for counter reset		
	Input 2 for status signal conveyor belt (on/off) or for pulse counting		
Interfaces	RS 232	For parameterization via PC/laptop with MEPA BULKSCAN program	
	RS 422	For communication with the laser scanner	
	Option Interfacemodul	For communication with host PC, optionally for RS 232, RS 422, RS 485	
	Module Profibus DP option	For data transfer to host PC	
Operating voltage	24 V DC • 15 % (ripple max. 500 mV)		
Power consumption	5 W		
Temperature range	–20 ... +55 °C (storage temperature –25 ... +70 °C)		
Degree of protection	IP 65		
Dimensions (W x H x D)	240 mm x 200 mm x 120 mm; polycarbonate housing		
Mass	1.5 kg		

* only when the BuULKSCAN is not connected with the program

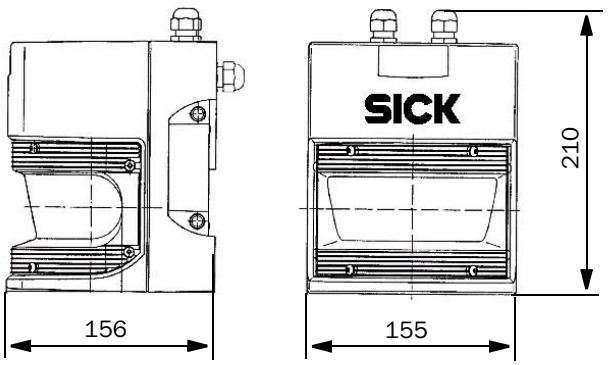
** required at temperatures below 0 °C; for LMS 200 optionally deliverable

Purge-air unit with fan 2BH1300	
Components	Mounting plate, air filter, purge-air fan, Y distributor, low-pressure monitor
Operating voltage	200 to 240 V / 345 to 415 V at 50 Hz; 220 to 275 V / 380 to 480 V at 60 Hz
Rated current	Δ 2.6 A / Y 1.5 A
Motor rating	0.37 kW at 50 Hz; 0.45 kW at 60 Hz
Delivery rate	max. 63 m^3/h; 48 m^3/h at back-pressure of 30 mbar
Ambient temperature	–20 ... +40 °C
Degree of protection	IP 54
Hose connections	Ø 40 mm
Dimensions	550 x 550 x 270 mm
Mass	14 kg
Purge-air unit in connection box	
Operating voltage	100...240 V AC, 47...63 Hz oder 24 V DC • 2 V
Power consumption	max. 70 W
Delivery rate	approx. 30 ... 50 m³/h
Ambient temperature	-20 ... +45 °C
Degree of protection	IP 65
Hose connections	Ø 40 mm
Dimensions (W x H x D)	300 mm x 400 mm x 220 mm
Mass	13.5 kg

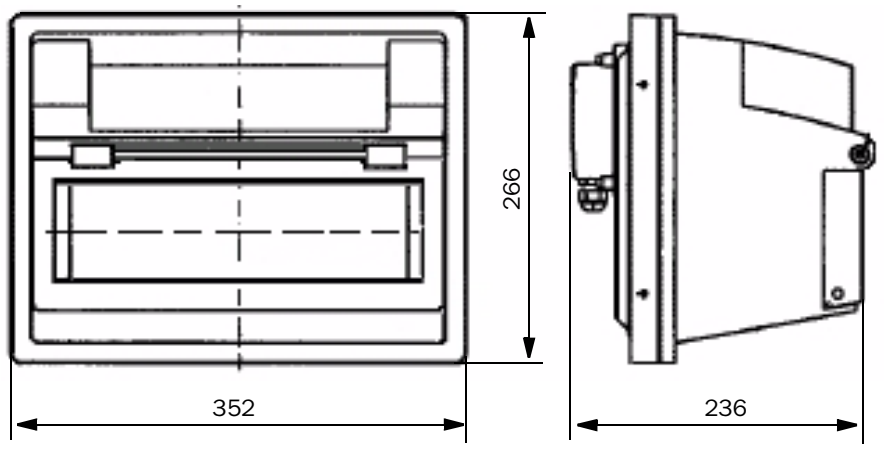
2.5 Dimensions and Part Numbers

2.5.1 Laser Scanner

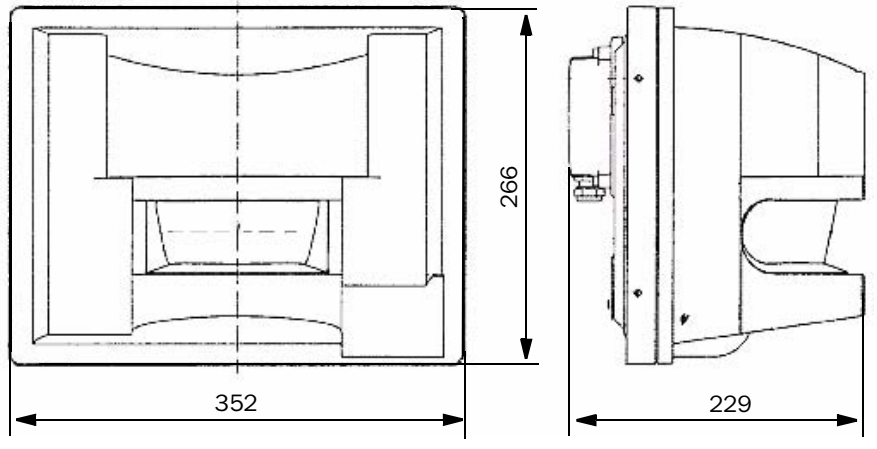
LMS200



LMS211



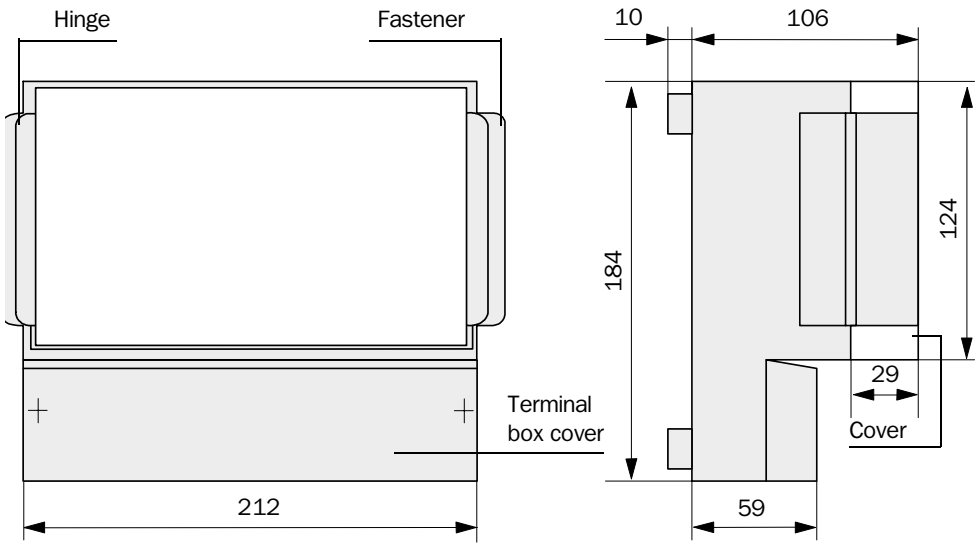
LMS221



Type Laser scanner	Part no.
LMS200-30106	1029095
LMS211-30106	1029096
LMS221-30106	1029097

Fig. 2.10: Laser scanner

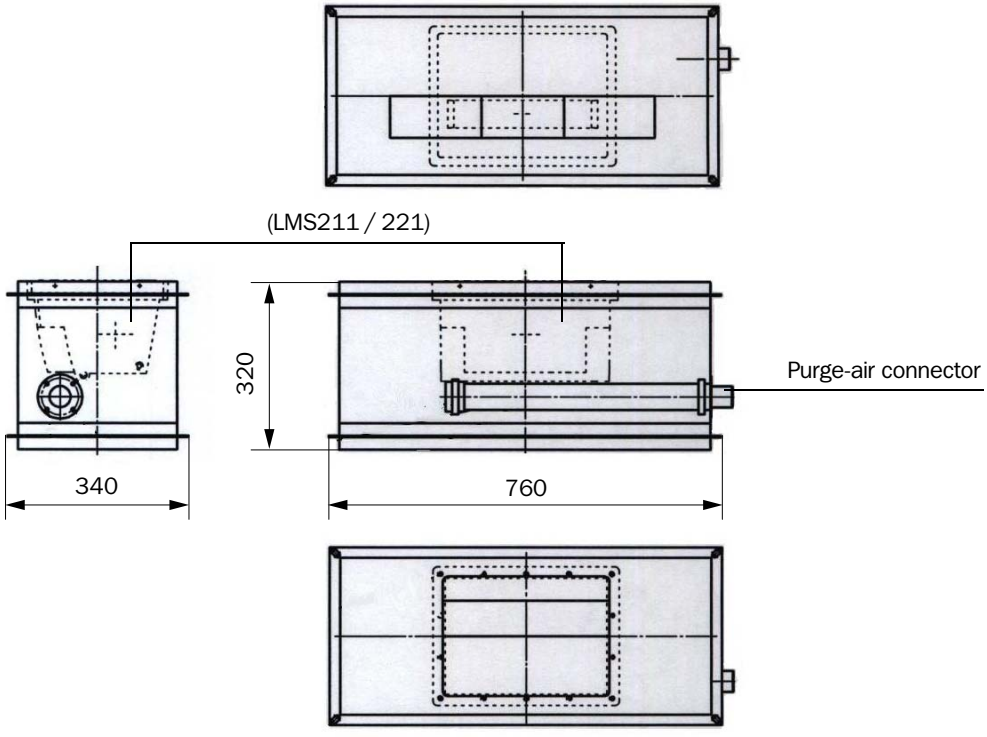
2.5.2 Evaluation Unit



Component	Part no.
LMI101 evaluation unit	7044000

Fig. 2.11: LMI101 evaluation unit

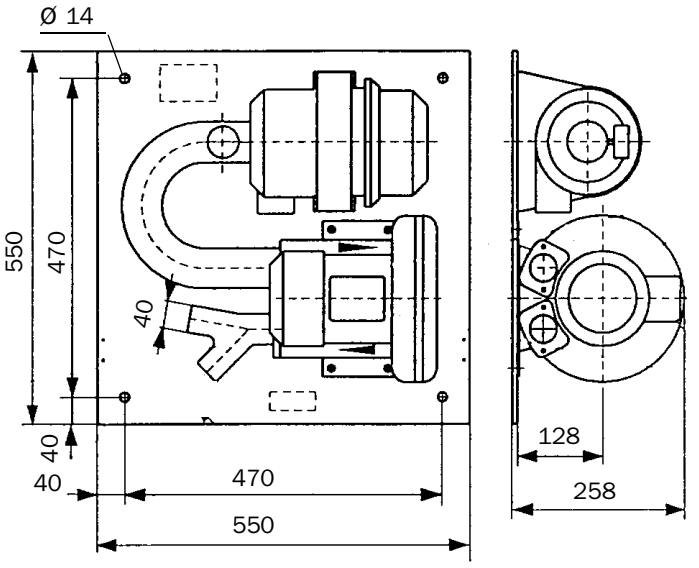
2.5.3 Dust Protection Outdoor



Component	Part no.
Dust protection outdoor	7044003

Fig. 2.12: Dust protection outdoor

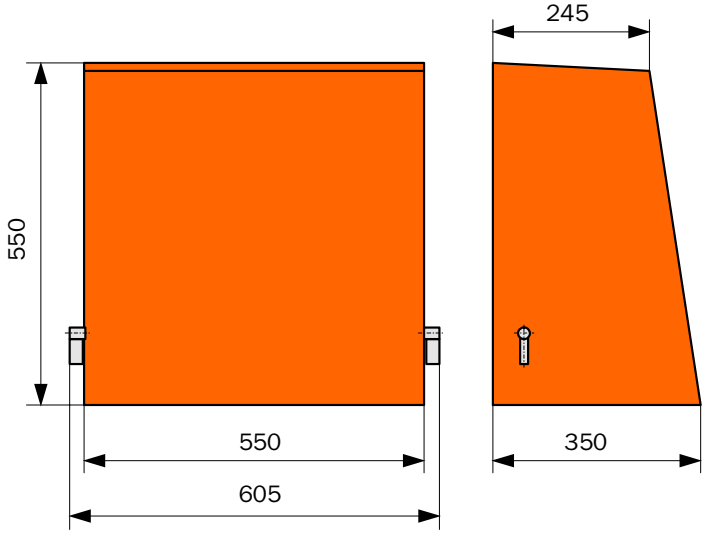
2.5.4 Purge-air Unit with Fan 2BH1300



Type purge-air unit	Part no.
SLV4-21112 with purge-air hose length 10 m	1012409
SLV4-21111 with purge-air hose length 5 m	1012424

Fig. 2.13: Purge-air unit with fan 2BH1300

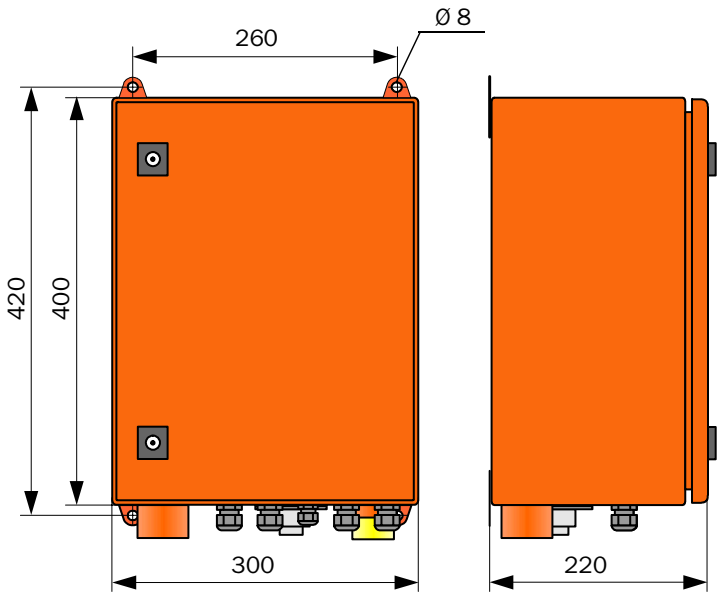
If the purge-air unit has to be installed in the open, the following weatherproof cover is required.



Component	Part no.
Weatherproof cover for purge-air unit	5306108

Fig. 2.14: Weatherproof cover for purge-air unit with fan 2BH1300

2.5.5 Purge-air Unit in Connection Box



Type purge-air unit	Part no.
SLV-AK 230 V	7040289
SLV-AK 24 V	1029127

Fig. 2.15: Purge-air unit in connection box

BULKSCAN

Conveyor Belt Monitor

Assembly and Installation

Project Planning

Assembly

Installation

3 Assembly and Installation

This chapter informes about the work which is required to install and connect the system components and options.

Measures for the installation of the air knife option (see Section *2.3.4*) are not listed here since the design of this option depends on the concrete conditions at the mounting location. A separate description can be supplied when required.

3.1 Project Planning

The following table provides an overview of the project planning work you have to carry out to ensure that the device is correctly installed and fully functional. You can use this table as a checklist by ticking off all the steps you have carried out.

Task	**Requirements**		**Step**	☑
Determine the measuring and installation locations	Scanning level	Must be at a place where the conveyor belt lies on the conveyor rollers to get always the same base for the profile determination independent of the belt load.	Choose the best possible location	☐
	Accessibility, accident prevention	The device components must be easily and safely accessible.	Provide platforms if necessary	☐
	Vibrations	No vibrations at the mounting location for the laser scanner; for evaluation unit as low as possible.	Take appropriate measures to eliminate/reduce vibrations.	☐
	Ambient conditions	For limit values, see "Technical data"; installation location for the laser scanner as dust-free as possible	If necessary, provide suitable protective measures.	☐
Choose the device components	• Installation location (inside or outside buildings) • Conveyor belt width (Scan angle)	Type of the laser scanner	Select the type according to Section *2.3*.	☐
	Bulk goods qualities	no dust, steam, fog	If necessary, use suitable components (see Section *2.3.4*).	
Electrical installation	Operating voltage, power demand, cable lengths	According to the technical data in Section *2.4*	Ensure sufficient cable cross-sections and fuse.	☐

If an analog or impulse signal shall be used to enter the belt velocity, corresponding sensors are required (have to be provided by the customer, no scope of supply of SICK MAIHAK).

3.2 Assembly

All of the assembly work has to be carried out by the customer. This includes:

- Installing the laser scanner above the conveyor belt.
- Installing the evaluation unit.
- Installing optional components.

DANGER

Warning

- When carrying out assembly work, observe the relevant safety regulations and the safety information in Chapter 1!
- Take suitable measures to protect against local or installation-specific hazards!

3.2.1 Installing the Laser Scanner

Details see Operating Instruction for the laser scanners

Installation over the centre of the belt with the light opening pointing downwards,

90 angle between the scanning level and the conveyor belt,

Retention of the minimum installation height according to the following correlations:

The laser scanner must be mounted centric over the conveyor belt using the supplied mounting parts (see table in Section *2.3.2*). Necessary mountings or carriers have to be provided and installed by the customer. In order to ensure the measuring accuracy, the following conditions have to be met.

Scanning level

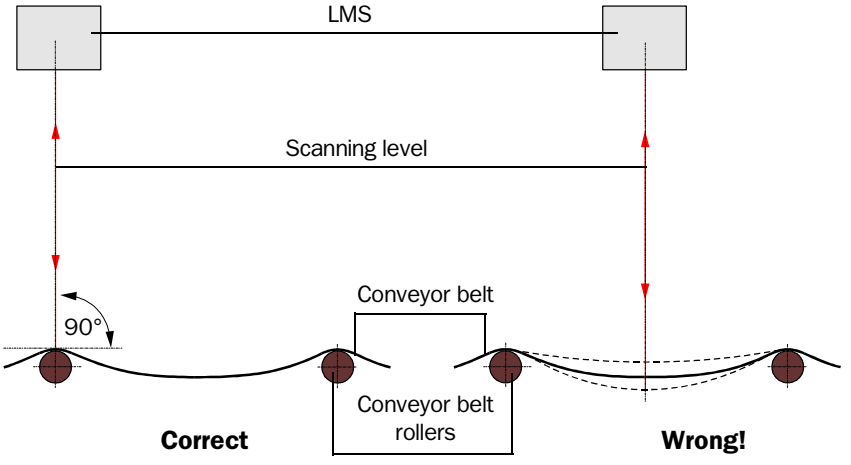


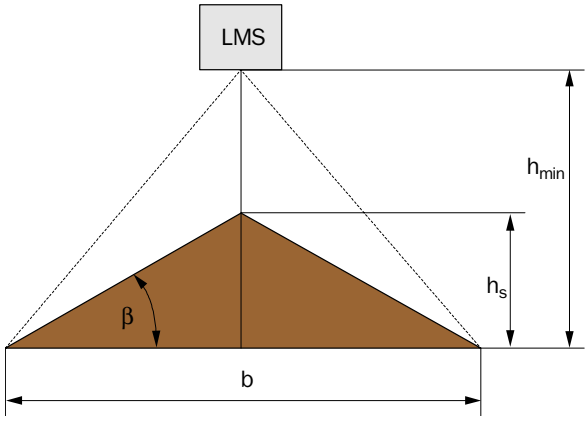
Fig. 3.1: Arrangement of the laser scanner above the conveyor belt

ATTENTION

Important

No fittings may be in the scanning level!

Installation heigth above the conveyor belt



$$h_s = \frac{b}{2} \cdot \tan \beta$$

$$h_{min} \geq 2 \cdot h_s = b \cdot \tan \beta$$

$h_{min} \geq$ 0.5 m for LMS200

$h_{min} \geq$ 1.0 m for LMS211/221

h_s = Height of the debris cone
h_{min} = Minimum installation height
b = Base of the debris cone
β = Angle of repose (typical values see table in the appendix Section *9.3*)

Fig. 3.2: Geometric correlation concerning the installation heigth above the conveyor belt

Example Typical installation heights for the bulk material gravel (values in m):

Belt width	Installation heigth	
	LMS200	LMS211/221
0.4	≥ 0.5	≥ 1.0
0.6	≥ 0.5	≥ 1.0
0.8	≥ 1.0	≥ 1.0
1.2	≥ 1.0	≥ 1.0
2.0	≥ 1.2	≥ 1.2
3.0	≥ 1.8	≥ 1.8

Notes

- When using a dust protection tube or purge air adapter (dust protection outdoor) the minimum height determined should be increased by 0.2 m.
- For applications with a belt width < 1 m, the mounting height has to be defined in coordination with the manyfactorer.

The maximum installation height is determined by the remission of the bulk goods and the minimum resolution angle demanded (see the Operating Instructions of the the scanner).

Scan angle

To reduce measuring errors, we recommend to choose the angles of beam (α1 and α2) in a way that allows to monitor only the maximum possible coverage of the belt (see **Fig. 3.3**).

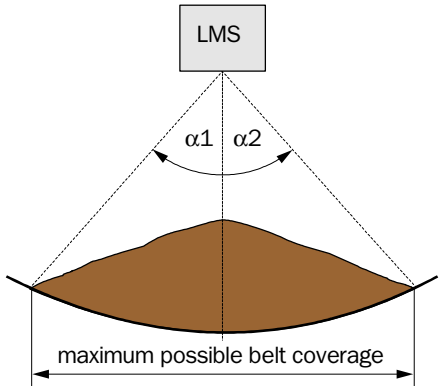


Fig. 3.3: Correlation between the belt width and the aperture angle of the scanner

3.2.2 Installing the LMI101 Evaluation Unit

The evaluation unit must be mounted on a level base at an easily accessible and protected location (see **Fig. 3.4**). The following must be taken into account:

- Observe the ambient temperature range specified in the technical data; protect it from direct sunlight if it's installed in open air (e.g by using the option weatherproof cover for evaluation unit, see Section *8.2.2*).
- The mounting location should be free of vibration; provide stabilization measures if necessary.
- Maximum cable length between LMS and LMI 500 m.

see Section *2.4*

- If the device is to be mounted in a vertical position, the cables must be routed from the bottom.
- Provide sufficient clearance for the cables and for opening the front panel.

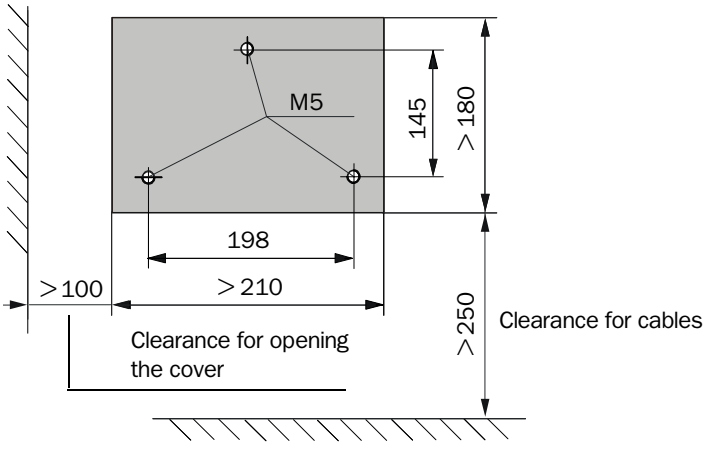


Fig. 3.4: LMI 101 mounting dimensions

3.2.3 Installing optional Components

Dust protection shield (for LMS211 only)

The dust protection shield has to be assembled at the LMS211 according to the operating instructions for the laser scanner.

Dust protection outdoor

Dimensions see Section *2.5.3*

The dust protection outdoor has to be mounted with built-in LMS211/LMS221 laser scanner by means of the enclosed mounting set at mountings or carriers to be installed by the customer. The details into Section *3.2.1* have to be observed.

Purge-air units for dust protection outdoor

The respective component must be mounted according to **Fig. 3.5** or **Fig. 3.6** at a location with air as clean as possible. If necessary, lay an intake hose or pipe at a location where the conditions are more favorable. In addition, take the following points into account:

see Section *2.4*

- Intake and ambient temperature must correspond to the technical data.
- The clearances according to **Fig. 3.5** or **Fig. 3.6** have to be observed.

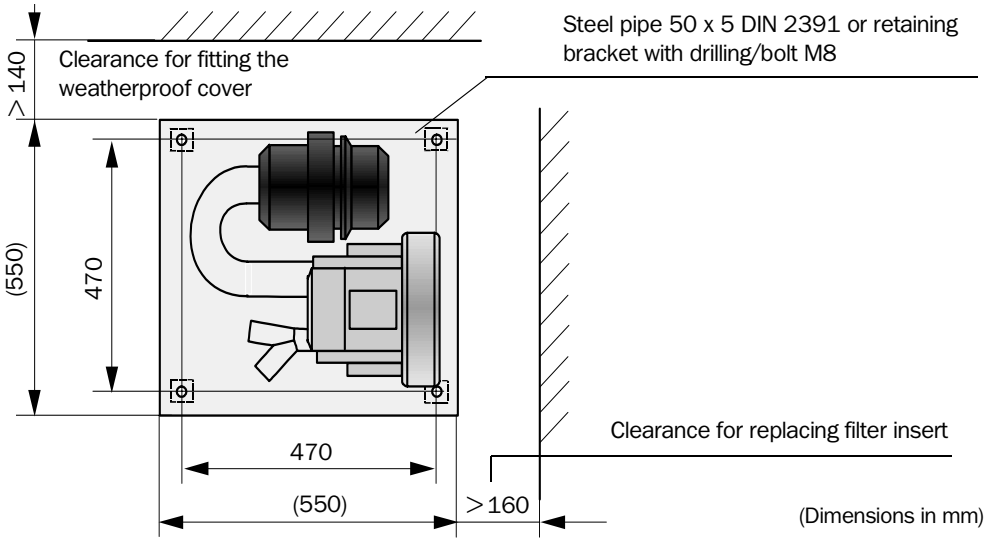


Fig. 3.5: Mounting dimensions for purge-air unit with fan type 2BH1300

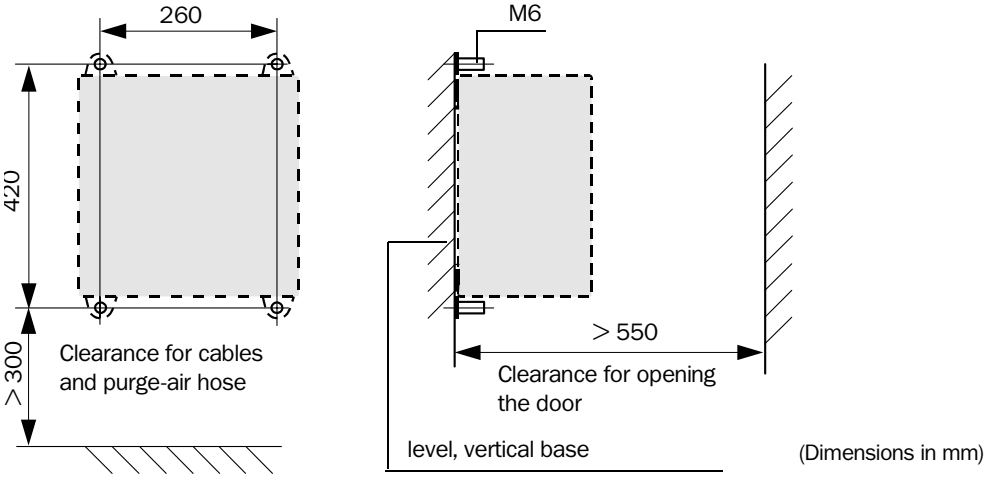


Fig. 3.6: Mounting dimensions for the purge-air unit in connection box

3.3 Installation

3.3.1 General Notes, Prerequisites

Before you start the installation work, you must have carried out the steps described in Section *3.2*.

Unless otherwise agreed with SICK MAIHAK or an authorized SICK MAIHAK representative, all of the installation work must be carried out by the customer. This include:

- Complete laying the power supply and signal cables
- Installing circuit-breakers and power fuses
- Connecting the power supply and signal cables to all system parts.

If an installed dust protection outdoor shall be supplied with purged air, in addition the work described in Section *3.3.4* has to be carried out.


DANGER

Warning

- All installation work must be carried out in line with the relevant safety regulations and instructions listed in Chapter 1.
- Take suitable measures to protect against local or plant-specific danger.

3.3.2 Connecting Evaluation unit and Laser Scanner

LMI 101 evaluation unit

The evaluation unit has to be connected according to **Fig. 3.7**.

Data see Section *2.4*

The operating voltage for evaluation unit and laser scanner can be supplied from on 24 V d.c. power supply unit. Using the scanner types LMS211 or LMS221 at ambient temperatures below 0 °C, also the internal heating can be connected to this power supply unit. In this case the increased power consumption has be taken into account with regard to the mains adapter and conductor cross-section.

see **Fig. 3.8**

The laser scanner has to be connected to the evaluation unit using a screened cable with twisted pairs of wires (e.g. Li2YCYv (TP) 2x2x0.5; can be delivered as an option, see Section *8.2.4*).


ATTENTION

Important

The RS 422 interface must be set at the laser scanner to secure a successful communication between evaluation unit and laser scanner. This requires the connection of pins 7 and 8 in the connection plug for LMS200 or when the type LMS211/221 is used, the pins 3 and 11 must be bridged (see **Fig. 3.7**).

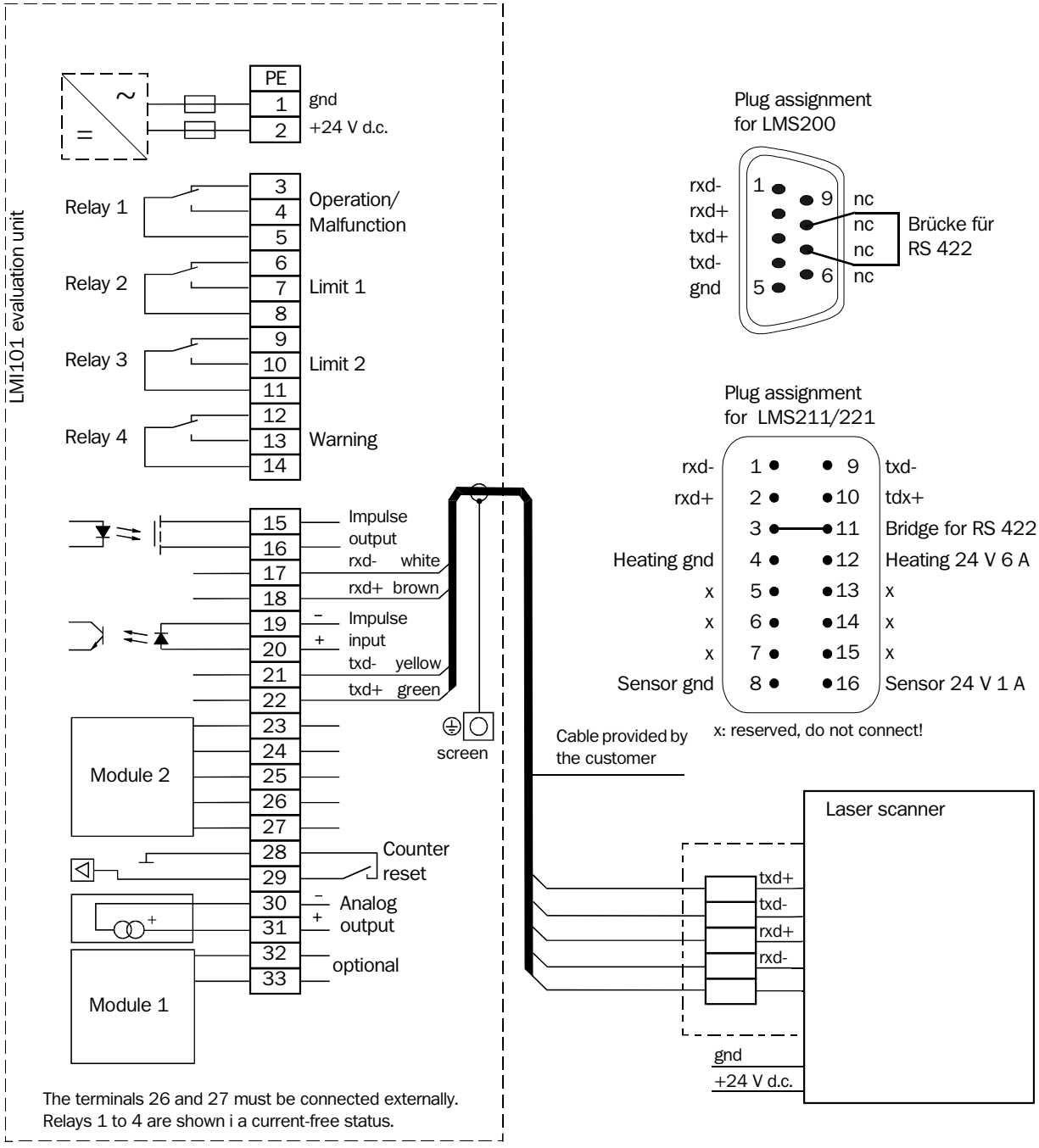


Fig. 3.7: LMI 101 connection

Terminal assignment for LMI - LMS connection cable

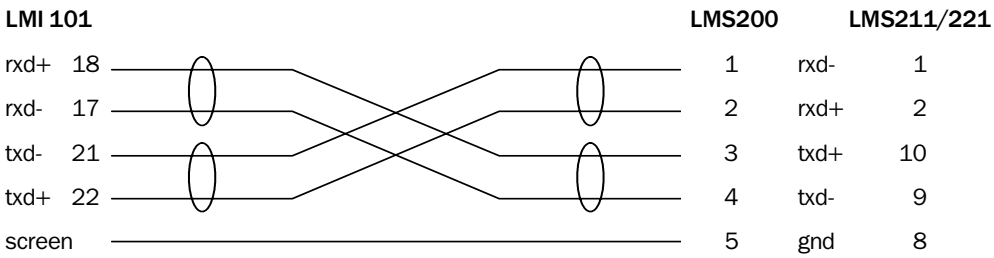


Fig. 3.8: LMI - LMS connection

Terminal assignment in the evaluation unit

Terminal	Assignment					
1	Supply Voltage gnd					
2	Supply voltage +24 V DC					
3, 4, 5	Relay Operation / Malfunction (relay is activ in status operation)					
6, 7, 8	Relay limit 1 (activated when a parameterized limit value is exceeded)					
9, 10, 11	Relay limit 2 (activated when a parameterized limit value is undershot)					
12, 13, 14	Relay warning					
15, 16	Impulse output (impulse counter for volume or mass)					
17, 18	RS 422 interface for the laser scanner (receiver)					
19, 20	Impulse input / Belt velocity status If a constant value is used for the belt velocity, an active status signal must be fed to this input (e.g. belt runs: 24 V; belt is stopped: 0 V)					
21, 22	RS 422 interface for the laser scanner (transmitter)					
	Option module 2, module type					
	Analog module		Interface module			Module Profibus DP
	Outputg	Input	RS 422	RS 485	RS 232	
23			rxd-	b		+5 V
24			rxd+	a	rxd-	Ready To Send (CNTR-P)
25			gnd iso		gnd iso	gnd
24	–	+	txd-	b		Data A
27	+	–	txd+	a	txd+	Data B
28, 29	Reset input for the counter The counters are reset when the contacts are closed (for at least 1 s)					
30, 31	Standard analog output 0/2/4 ... 20mA					
32, 33						
	Option module 1, analog module					
	Output			Input		
32	–			+		
33	+			–		

Note If an analog source is used for input the belt velocity (e.g. tachometer generator) or bulk goods density, an additional analog module is required to be connected as an input according to the table above.

3.3.3 Installation of Analog Module, Interface Module and Profibus DP Module

- Undo the four screws and take off the front panel cautiously.
- Plug the module on to the corresponding socket (see **Fig. 3.9**), make sure all connectors are firmly seated.
- Connect the module(s) according to the previous table.
- Reassemble the evaluation unit.

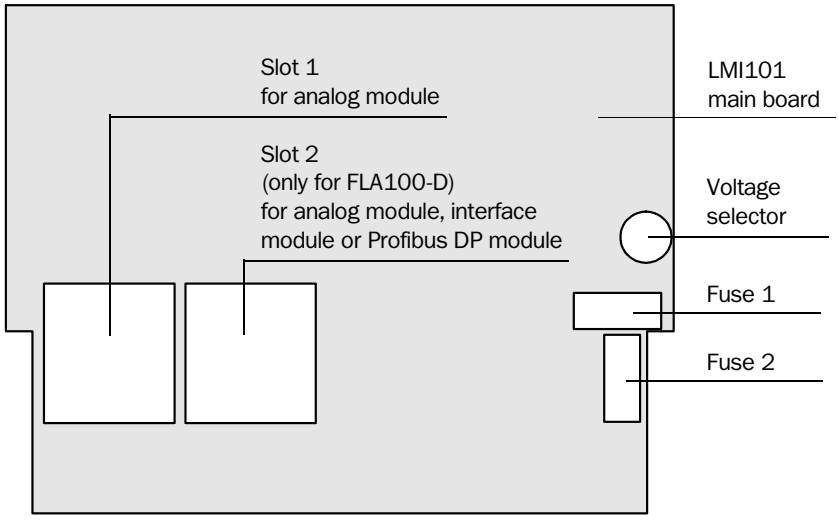


Fig. 3.9: Slots for optional modules

Note Communication via the interface module is based on a SICK MAIHAK-specific protocol. A description (protocol frame) can be provided on request.

Bus termination for Profibus DP module

The module is delivered with two jumpers (JP1A and JP1B, see **Fig. 3.10**) to terminate the bus line. If the BULKSCAN is not connected at the terminal end of a bus line, remove these two jumpers.

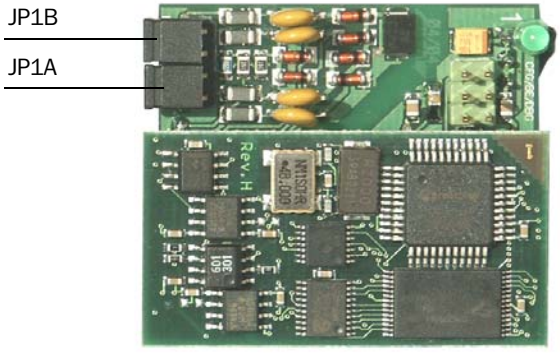


Fig. 3.10: Profibus DP module

3.3.4 Connecting/Commissioning the Purge-air Supply for the Dust Protection Outdoor

Purge-air unit with fan type 2BH1300

- Compare the supply voltage and frequency with the specifications on the rating plate of the purge-air motor.

Important

Do not connect the purge-air unit if the values do not match!

ATTENTION

- Connect the power supply cable to the terminals on the blower motor (terminal assignment see supplementary sheet on purge-air motor and cover of motor terminal box; general arrangement see the following figure).

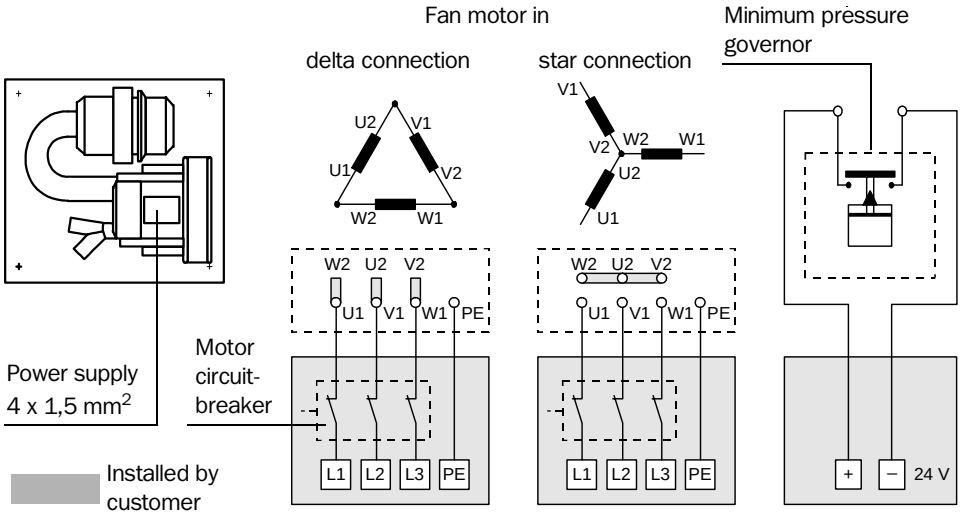


Fig. 3.11: Electrical connections for the purge-air unit with fan type 2BH1300

- Connect the protective conductor to the terminal.
- Set the motor circuit-breakers in accordance with the connection data of the fan (see Section *2.4*) to a value 10% greater than the rated current.

Important

The blower must be fused separately from other system components. The fuse type must match the rated current (see Section *2.4*). Fuse each phase separately. Provide circuit-breakers to protect against a phase failure on one side.

ATTENTION

- Check the functioning and running direction of the fan (flow direction of the purge-air unit must match the arrows at the inlet and outlet openings on the fan). If the direction of running on 3-phase motors is incorrect, swap power connections L1 and L2.
- Connect the (optional) pressure monitor for monitoring the purge-air supply.
- Connect the purge-air outlet at the Y distributor and the connector at the dust protection outdoor using the supplied purge-air hose and secure it with hose clamps. The second purge-air outlet must be closed.

If you are in doubt, or if you are using a special motor version, the operating instructions supplied with the motor should take priority over any other information.

Purge-air unit in connection box

- Connect the power supply cable to the terminals L1, N und PE at the terminal strip.
- Connect the purge-air hose to the purge-air outlet (underside of the purge-air unit, see **Fig. 3.12**) and the connector at the dust protection outdoor and secure it with hose clamps. The purge-air outlet must be adjusted in the shown way (adjust if necessary).

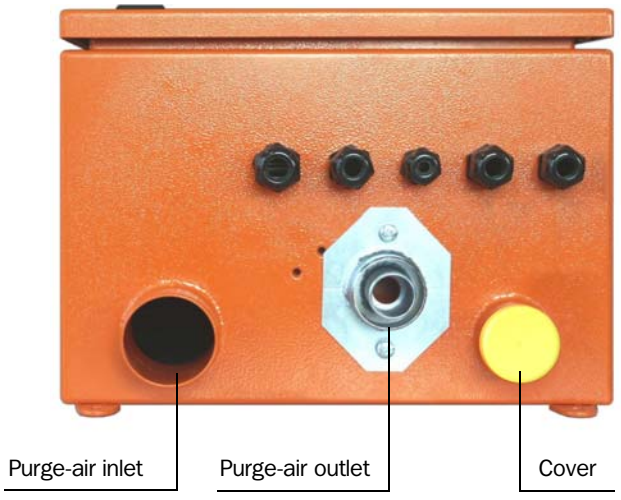


Fig. 3.12: Underside of the purge-air unit in connection box

BULKSCAN

Conveyor Belt Monitor

Commissioning and Parameterization

4 Commissioning and Parameterization

4.1 Basics

4.1.1 General Notes

Commissioning work is limited to memorising the reference contour and parameterization of the input and output signals. To carry out the required work, the accompanying operating program, MEPA BULKSCAN, must be used. This programme offers the possibility of displaying continual measuring data, measured values and the evaluation unit status signals, as well as the modification of parameters.

For problem-free commissioning it is vital that, when placing an order, all information given in the technical questionnaire is as accurate as possible. If this is the case, the appropriate parameters will be set at the factory.

Note Device functions can be set or changed only after entering a password (password see appendix).

4.1.2 Prerequisites

- Assembly and installation according to Section 3.2 and 3.3 must be completed.
- Laptop/PC with:
  - Processor: Pentium 2 or higher
  - VGA graphics card
  - Serial interface COM 1 or COM 2
  - Main memory (RAM): minimum 32 MB
  - Operating system: Microsoft Windows 98 or higher
- Interface cable (serial cable; see Options, section *8.2.5*) for connecting a laptop/PC to the BULKSCAN.
- The MEPA BULKSCAN operating and parameterization program must be installed on the laptop/PC. To install the program, insert the CD supplied into your CD drive, call up the corresponding drive, run the "Bulkscan_Setup.exe" file, and follow the instructions.
- The power supply must be switched on.

Pin assignment

RS 232 socket in the control cabinet	PC connector, 9 pole
Pin 2 (txd)	Pin 2 (rxd)
Pin 3 (rxd)	Pin 3 (txd)
Pin 5 (gnd)	Pin 5 (gnd)

As standard the directory C:\BULKSCAN is created for the programme file. However the programme can also be installed in any other freely selectable directory.

4.1.3 Connecting the Device

- Connect the laptop/PC to the evaluation unit using the interface cable.
- Change to the installation directory and start "Bulkscan.exe" or click on the program icon in the program manager (is automatically set up during installation).

Note The program will be started automatically If you place the program icon in the "Autostart" menu.

After initialisation of the operating program this tries to get a connection to the device and read the actual parameters from the evaluation unit.

When the connection is successfully established, the following main menu appears on the screen showing the bulk good profile scanned by the laser scanner at this moment.

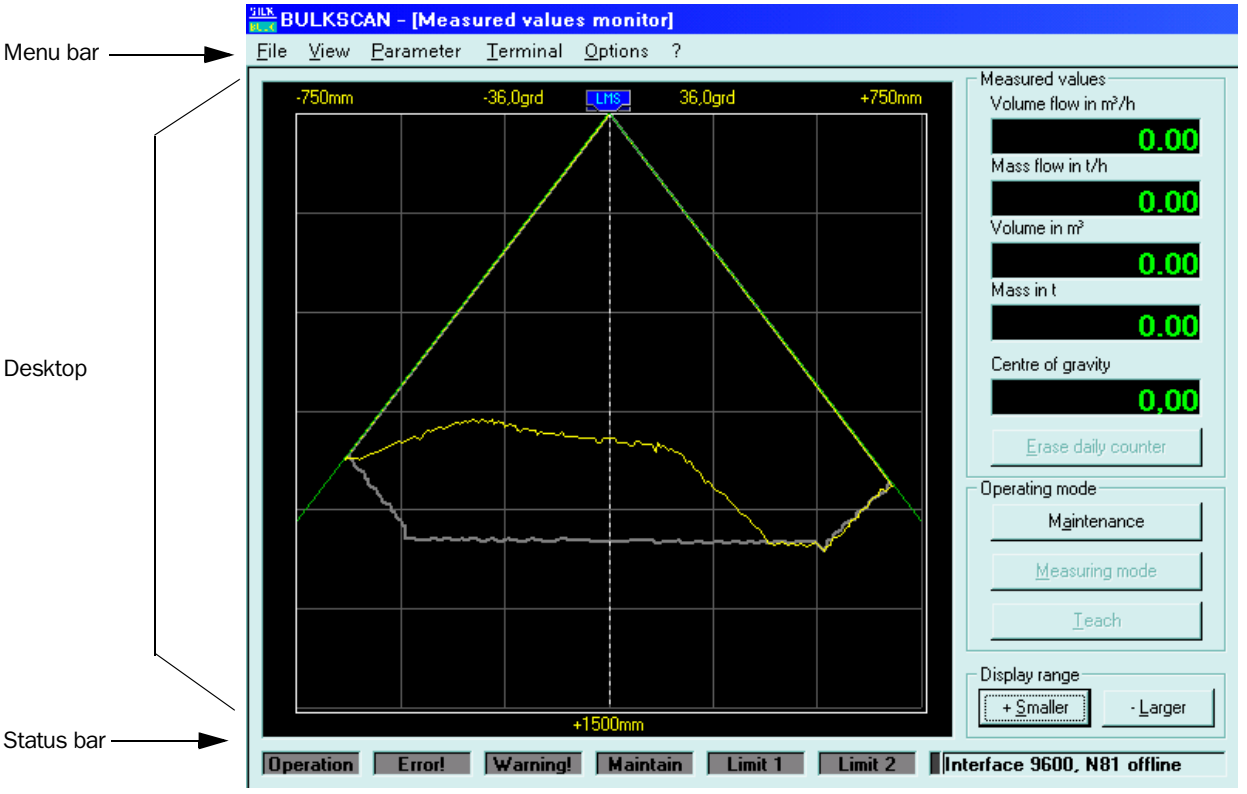


Fig. 4.1: Main menu of the MEPA BULKSCAN program

If the measuring system is not correctly connected to the PC (e.g. wrong interface set in the PC), or is not working, the following messages are displayed:

Fig. 4.2: No connection to the device

To correct that, select a free interface port in the "Options/Interface" menu (see the following figure) or switch on the measuring system.

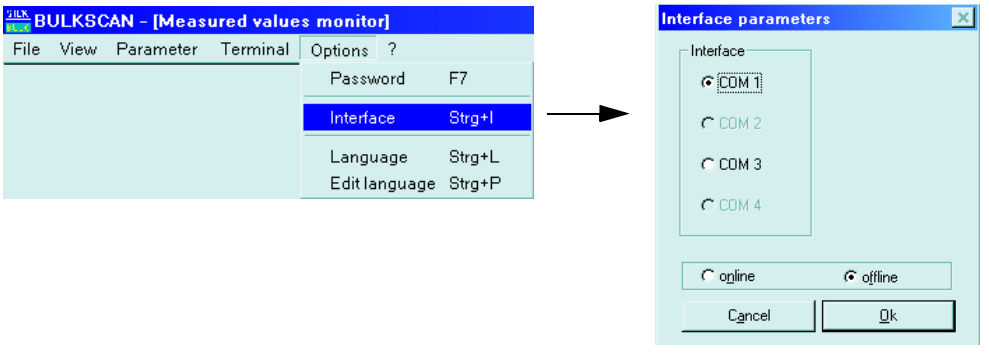


Fig. 4.3: Selecting the interface port

4.2 Programme Description

4.2.1 Main Menu

see **Fig. 4.1** The screen is divided into the areas menu bar, desktop and status bar

Menu bar

Menu	Submenu	Function
File		• Reentry of submenus into the main menu • Closing the program
View	Actual measured scan	Display of the contours available only within the set angle range
	Actual scan	Display of all contours recorded by the scanner
Parameter administration	View parameters	Display of the set parameters
	Edit parameters	Enter and change of parameters after entering the password
	Calibration	Calibration of the measuring system using a reference (e.g. defined volume)
Terminal		For direct communication with the evaluation unit via terminal commands (delivered by SICK MAHIHAK on request)
Options	Password	Window for setting the password
	Interface	Selection of the interface on the laptop/PC
	Language	Selection of the operating language
	Edit language	Editor for simple exptension of the user language file

Note The menus can be selected also with the key combination <Alt> + first letter of the menu (lower case or capital letter).

Desktop

see **Fig. 4.1** This area consists of a window with a cartesian grid displaying data measured by the laser scanner and the fields "Measured values", "Operating mode" and "Display range". The grid can be scaled up or down using the buttons "+Larger"or "-Smaller" in the field "Display range". The green lines correspond to the parameterized angles of beam $\alpha 1$ and $\alpha 2$. The respective angle can be read in the upper part of the graphic. The angles of beam can be changed in "maintenance" mode with graphic support by using the mouse (see Section *4.3.3*). If a reference contour has already been saved in the evaluation unit, it is displayed as a thick grey line. The yellow line represents the current bulk good profile. It corresponds to the scanned contour (red line) but is only evaluated in the range of the angle of beam.

The actual measured values for volume and mass flow, total volume and total mass, and center of gravity are displayed in the "Measured values" field. The counters for the total values can be reset using the "Erase daily counter" button located below. The daily counted totals will be calculated up to a maximum of 10 million m^3 or tonnes and then automatically restarts from 0.

Using the respective buttons in "Operating mode" field, the device can be alternated between maintenance, measuring mode and memorising.

Status bar

The device status, any set limit values set and the connection between the PC and the evaluation unit are displayed in this line. When a malfunction occurs the corresponding window comes on red. By clicking on this window using the mouse the malfunction is specified more exactly.

4.2.2 "Parameter" Menu

The parameters are divided into the following tabs:

- System parameters
- Inputs/output
- Measurement
- Limits
- Center of gravity.

see Section *4.3*

You must enter the password before you can set or change a parameter. This protects the entire set of device parameters against unintentional modifications. Clicking on the "Set parameters" button transmits the altered parameters to the evaluation unit.

"System parameter" tab

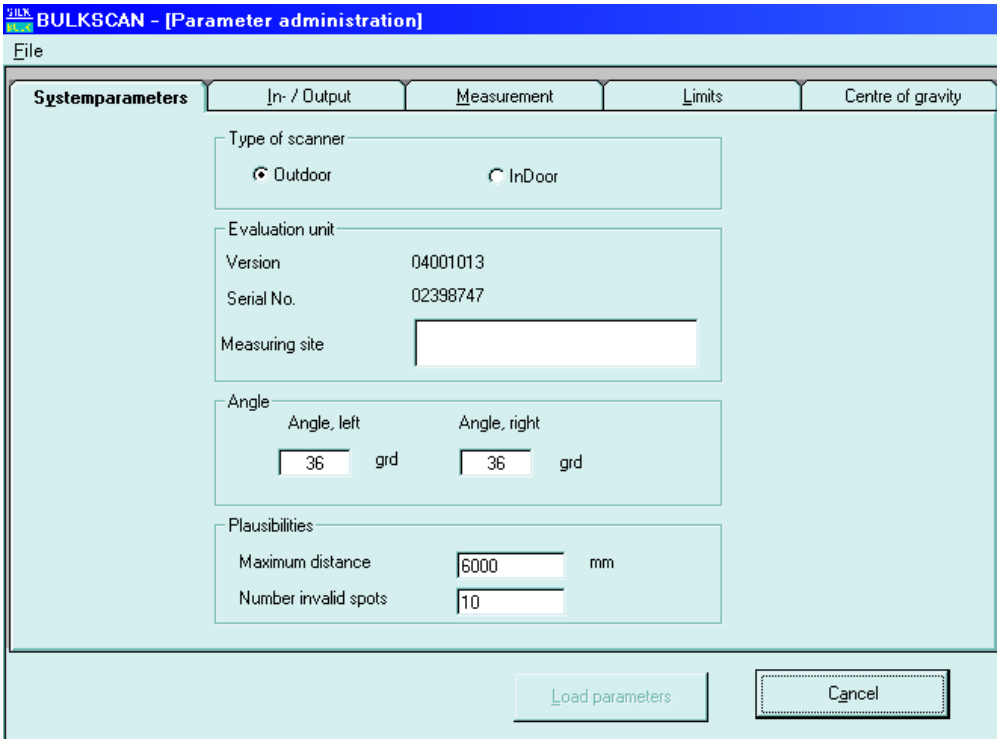


Fig. 4.4: "System parameter" tab

Field	Explanation
Evaluation unit	Firmware data on the evaluation unit with input field for the particular measuring site.
Angle, left, right	For setting the angle range (angles $\alpha 1$ and $\alpha 2$) of contour data provided by the scanner (preset from -50 ° to +50 °). The angle area can also be entered in graphically using the mouse.
Maximum distance	Default value; can be adapted to the actual conditions.
Number of invalid spots	Value serves to reduce invalid measurements e.g. at shiny or wet conveyor belts; a warning is indicated if the set value is exceeded.
Load parameters	Re-reads the parameters from the LMI.

Note TThe measuring system is configured automatically on the connected scanner type.

"In-/Output" tab

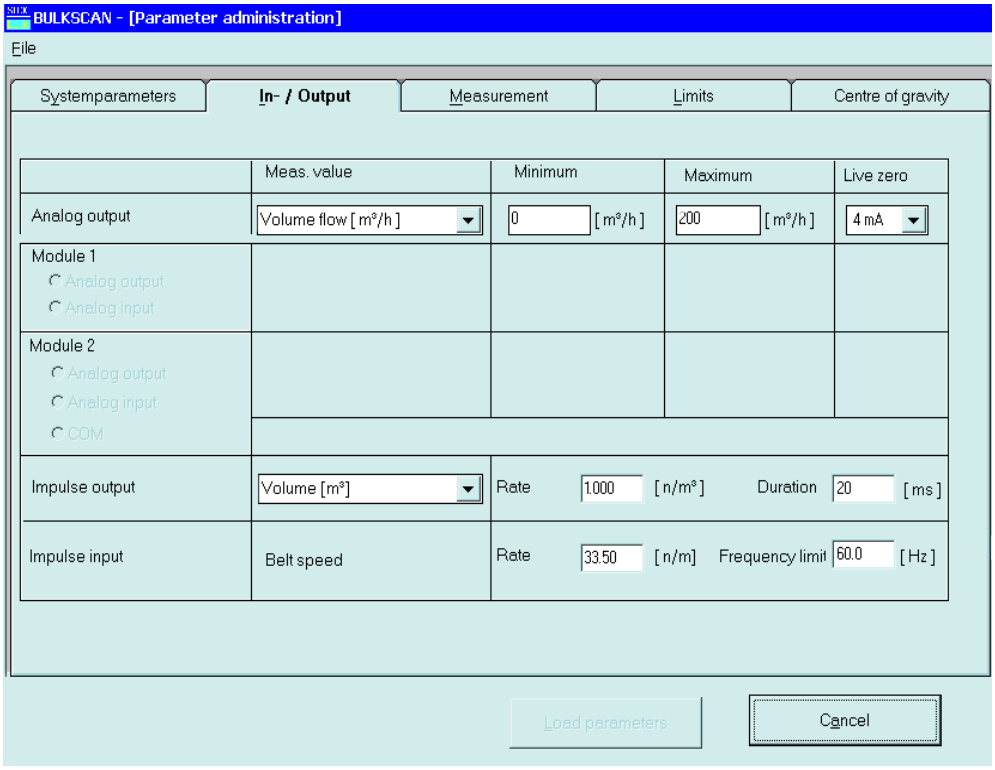


Fig. 4.5: "In-/Output" tab

Field		Explanation
Analog output	Meas. value	Selection of the measuring variable to be given out
	Minimum	Smallest output value (corresponds to Live Zero)
	Maximum	Largest output measured value (corresponds to 20 mA)
	Live zero	mA value for the Live Zero signal
Module1	Analog output	Selection of the measuring variable and definition of minimum value, maximum value and Live Zero as for standard output
	Analog input	
Module 2	Analog output	Selection of the measuring variable and definition of minimum value, maximum value and Live Zero as for standard output
	Analog input	
	COM	Setting the module as an interface module
Impulse output	Meas. value	Selection of the variable to be output as an impulse repetition frequency
	Pulse rate	Number of pulses per measuring unit of the selected variable Example: Pulse rate = 0,1 n/m³ → one pulse is output per 10 m³
	Pulse duration	Duration of pulse in m/s
Impulse input		Parameterization when a pulse generator for belt velocity is connected
	Pulse rate	Number of registrated pulses per metre of moving belt
	Limit frequency	Low pass filter which can be parameterized for the impulse input to suppress contact bounces
Load parameters		Resets the parameters to the previous setting

"Measurement" tab

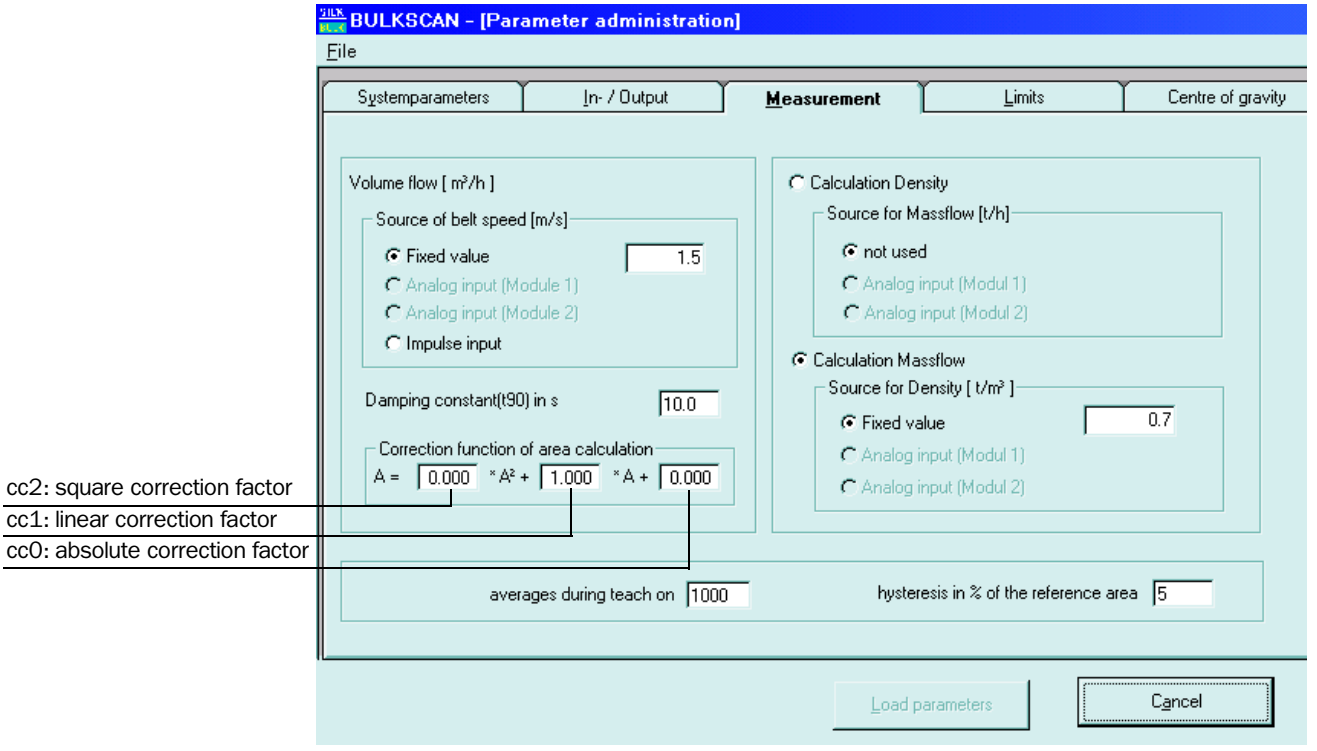


Fig. 4.6: "Measurement" tab

Field		Explanation
Volume flow	Source of belt speed	Selection between constant value, analog input (module 1 or 2), impulse input
	Damping constant (t90) in s	Input of the t_{90} time (see Section *2.2.2*) Practicable values: 1 to 10
	Correktion function for area calculation	Input of the coefficients of a calibrating polynomial 1. or 2nd order to calibrate the BULKSCAN (e.g. by means of a reference measuring system)
Calculation density	Analog output	Input of the mass flow as a constant value or via an analog input
Calculation mass flow	Analog input	Input of bulk goods density as a constant value or via the analog input
Averages during teach on		Number of scans that are used to memorise the reference contour
Hysteresis in % of the reference area		Minimal cross-sectional area required to start the measurement in relation to memorised reference area Practicable values: 1 to 5

"Limits" tab

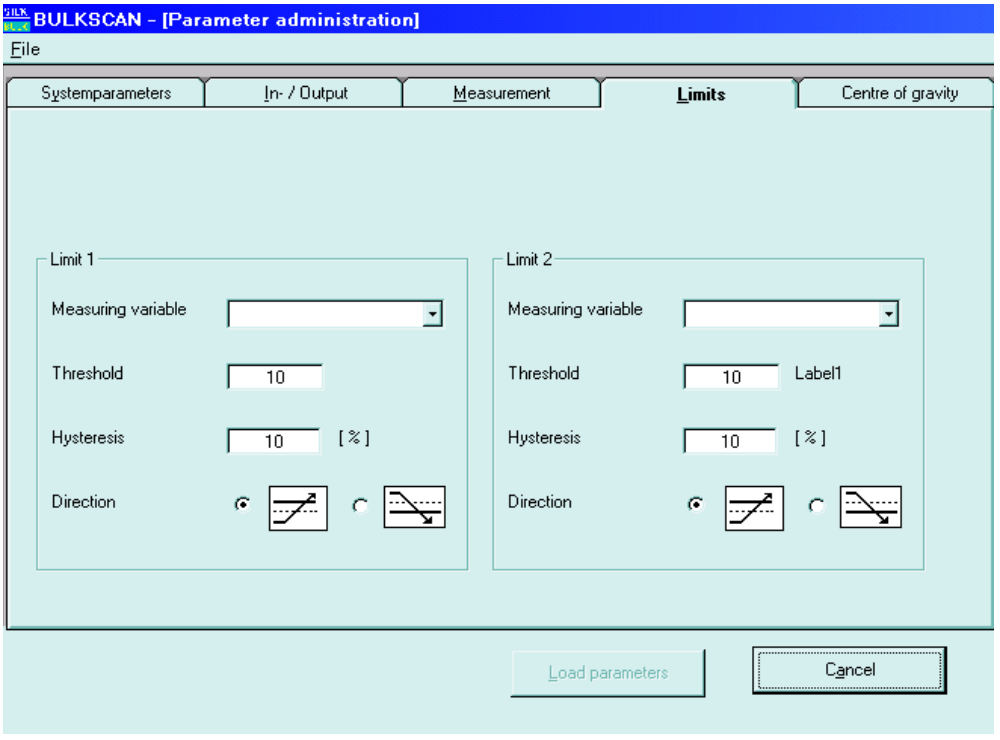


Fig. 4.7: "Limits" tab

Field	Explanation
Measuring variable	Selection of the variable to be monitored
Threshold	Limit value for the selected measuring variable; indication when the measured value lies between the switching threshold and the hysteresis set
Hysteresis	Percentage of the switching threshold
Direction	Triggered by violation above or below

"Center of gravity" tab

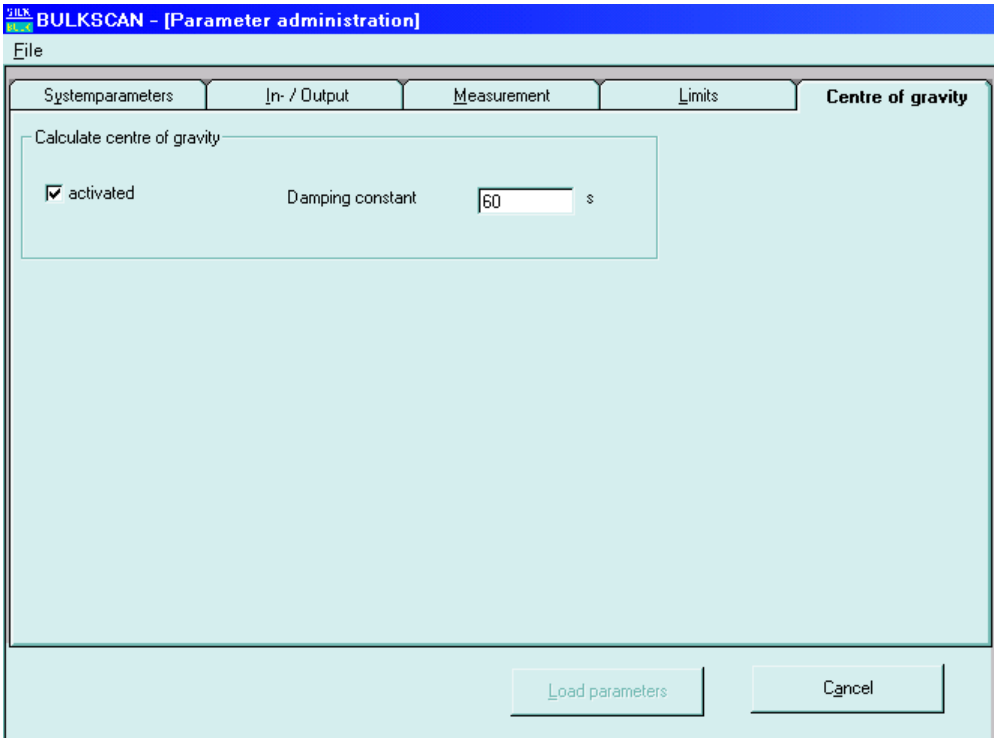


Fig. 4.8: "Center of gravity" tab

Check box	Explanation
activated	Activation/deactivation of the calculation
Damping constant	Input of a value to smooth measurement fluctuations analogic the t_{90} time; typical values 10 ... 60 s

4.2.3 "Options" Menu

This menu offers the possibilities represented into the following figure.

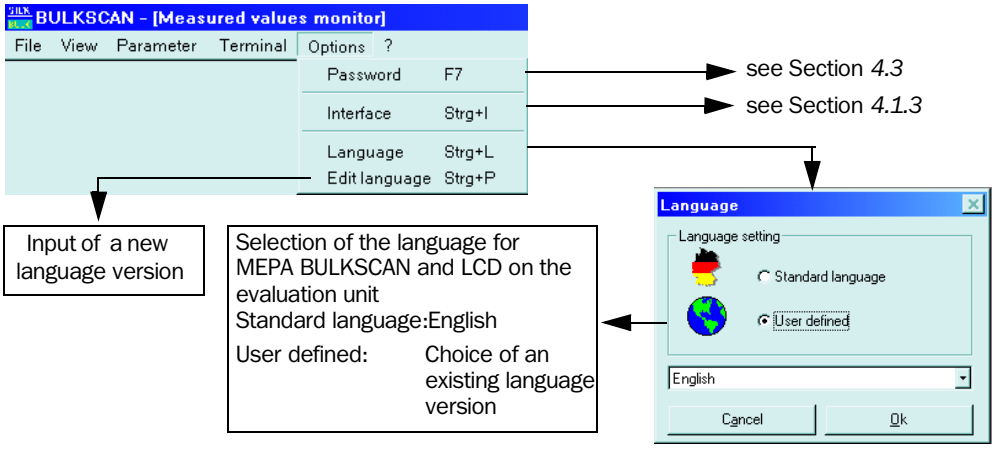
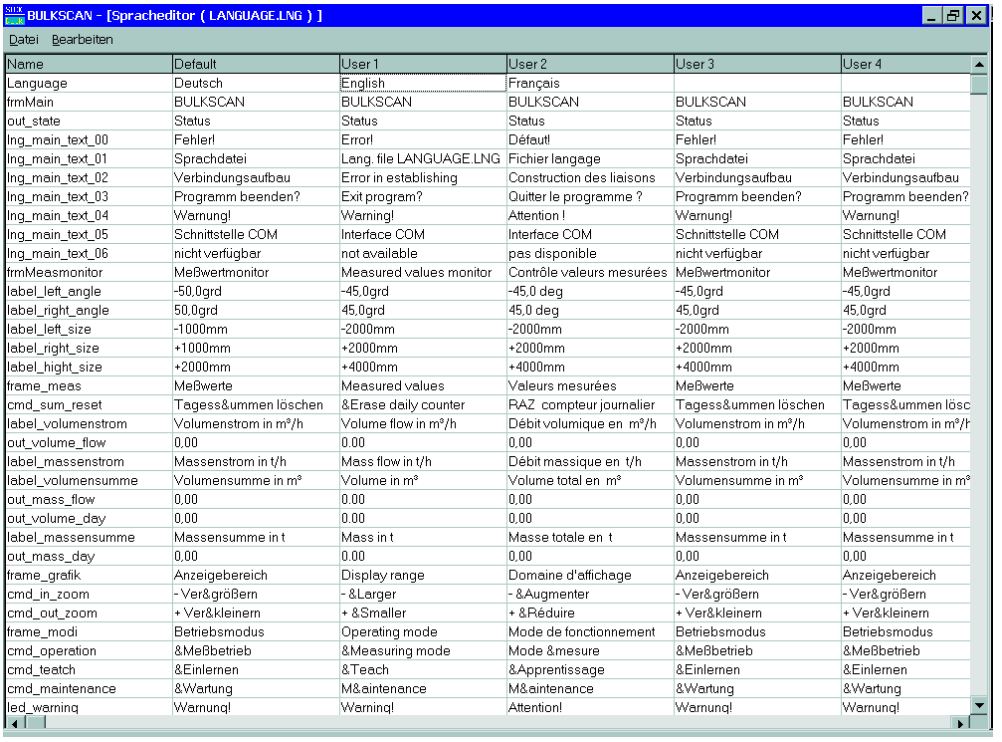


Fig. 4.9: "Options" Menu

Edit language

If you select this submenu, the following list is available.



Name	Default	User 1	User 2	User 3	User 4
Language	Deutsch	English	Français		
frmMain	BULKSCAN	BULKSCAN	BULKSCAN	BULKSCAN	BULKSCAN
out_state	Status	Status	Status	Status	Status
lng_main_text_00	Fehler!	Error!	Défaut!	Fehler!	Fehler!
lng_main_text_01	Sprachdatei	Lang. file LANGUAGE.LNG	Fichier langage	Sprachdatei	Sprachdatei
lng_main_text_02	Verbindungsaufbau	Error in establishing	Construction des liaisons	Verbindungsaufbau	Verbindungsaufbau
lng_main_text_03	Programm beenden?	Exit program?	Quitter le programme ?	Programm beenden?	Programm beenden?
lng_main_text_04	Warnung!	Warning!	Attention !	Warnung!	Warnung!
lng_main_text_05	Schnittstelle COM	Interface COM	Interface COM	Schnittstelle COM	Schnittstelle COM
lng_main_text_06	nicht verfügbar	not available	pas disponible	nicht verfügbar	nicht verfügbar
frmMeasmonitor	Meßwertmonitor	Measured values monitor	Contrôle valeurs mesurées	Meßwertmonitor	Meßwertmonitor
label_left_angle	-50,0grd	-45,0grd	-45,0 deg	-45,0grd	-45,0grd
label_right_angle	50,0grd	45,0grd	45,0 deg	45,0grd	45,0grd
label_left_size	-1000mm	-2000mm	-2000mm	-2000mm	-2000mm
label_right_size	+1000mm	+2000mm	+2000mm	+2000mm	+2000mm
label_hight_size	+2000mm	+4000mm	+4000mm	+4000mm	+4000mm
frame_meas	Meßwerte	Measured values	Valeurs mesurées	Meßwerte	Meßwerte
cmd_sum_reset	Tagess&ummen löschen	&Erase daily counter	RAZ compteur journalier	Tagess&ummen löschen	Tagess&ummen lösc
label_volumenstrom	Volumenstrom in m³/h	Volume flow in m³/h	Débit volumique en m³/h	Volumenstrom in m³/h	Volumenstrom in m³/h
out_volume_flow	0,00	0.00	0,00	0,00	0,00
label_massenstrom	Massenstrom in t/h	Mass flow in t/h	Débit massique en t/h	Massenstrom in t/h	Massenstrom in t/h
label_volumensumme	Volumensumme in m³	Volume in m³	Volume total en m³	Volumensumme in m³	Volumensumme in m³
out_mass_flow	0,00	0.00	0,00	0,00	0,00
out_volume_day	0,00	0.00	0,00	0,00	0,00
label_massensumme	Massensumme in t	Mass in t	Masse totale en t	Massensumme in t	Massensumme in t
out_mass_day	0,00	0.00	0,00	0,00	0,00
frame_grafik	Anzeigebereich	Display range	Domaine d'affichage	Anzeigebereich	Anzeigebereich
cmd_in_zoom	- Ver&größern	- &Larger	- &Augmenter	- Ver&größern	- Ver&größern
cmd_out_zoom	+ Ver&kleinern	+ &Smaller	+ &Réduire	+ Ver&kleinern	+ Ver&kleinern
frame_modi	Betriebsmodus	Operating mode	Mode de fonctionnement	Betriebsmodus	Betriebsmodus
cmd_operation	&Meßbetrieb	&Measuring mode	Mode &mesure	&Meßbetrieb	&Meßbetrieb
cmd_teatch	&Einlernen	&Teach	&Apprentissage	&Einlernen	&Einlernen
cmd_maintenance	&Wartung	M&aintenance	M&aintenance	&Wartung	&Wartung
led_warning	Warnung!	Warning!	Attention!	Warnung!	Warnung!

Fig. 4.10: Edit language menu

To compile a new user defined language, choose a column and enter the name of the language (i.e. Danish) in the first line. This name will then appear in the list entry menu under “Enter Language”. Then translate the text line for line in the chosen language column and save the file (“File” menu).

Note

- To use the hot key control (Alt+letter), set the sign “&” before a letter to be defined. This letter is displayed then underlined and can be used as a short cut for carrying out the specific task.
- No double key combinations may occur in any one menu.

4.3 Commissioning

Commissioning work is limited to memorising the reference contour and parameterization of the input and output signals. Before you start the required work, make sure that the measuring system is switched on and connected to the operating program (see Section *4.1.3*). If an analog or pulse signal shall be used to input the belt speed, a corresponding sensor must be connected to the system. If the system shall operate with a fixed value for the belt speed, a status signal (band runs/stands) must be provided.

To set or change parameters, the maintenance mode must be active and the password must be entered.

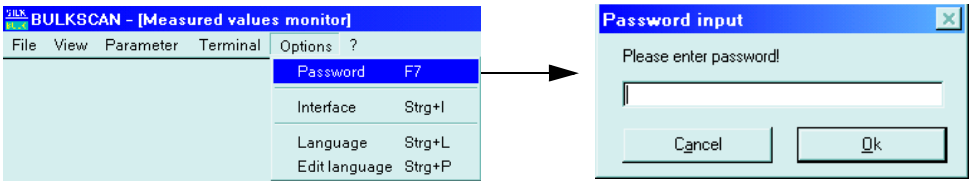


Fig. 4.11: Entering the password

4.3.1 Memorising the Reference Contour

The reference contour is the base to determine the cross-sectional area of the bulk good (see Section *2.2.2*). The determination is carried out in two steps:

1. Setting the measuring range of the laser scanner

   The angles of beam α1 and α2 have to be set in such a way that the maximum possible belt coverage can still be registered. You can do this in the "Parameters / Edit parameters" menu in the "System parameters" tab (see **Fig. 4.4**) or in the main menu (see **Fig. 4.1**) by using the mouse. To do this move the mouse to the left or right quadrant of the graphic as required and press the left mouse button (hold down). A red line appears between the scanner symbol and the mouse cursor, and this should be set to the desired angle position with the mouse. Releasing the mouse button fixes the angle setting and transfers it to the evaluation unit.

2. Comprehending and storing the contour of the empty conveyor belt

   Signalisation in the status bar

   ▶Set the measuring system into maintenance mode (click on button "Maintenance" in the main menu or use keys <Alt> + <w>).

   ▶ Start the learning process by clicking on the button "Teach" or use keys <Alt> + <e>.

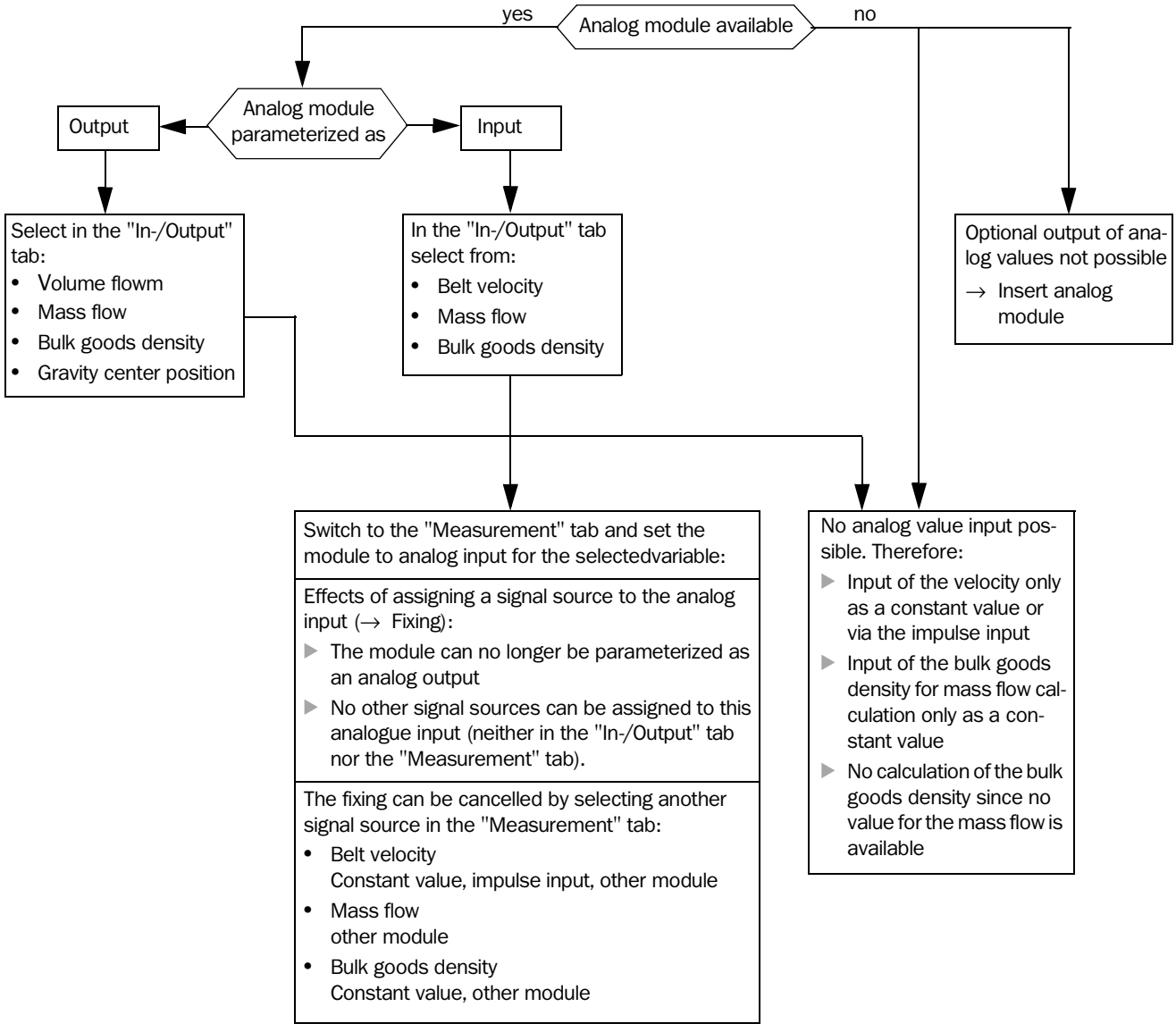
   The progress of the memorising process is displayed on the screen as a percentage and flashing of the "Maintenance" LED on the front panel of the evaluation unit.

After successful completion of the memorising process the reference contour is saved in the memory and shown in the graphic display of the contour data as a grey line.

Notes

- The reference contour may be taught to the device when the conveyor belt is empty and moving.
- This process lasts about 15 seconds and the evaluation unit is unable to respond during this period.
- If the angles of beam were not chosen optimally, repeat the memorising process after correcting the angle setting to optimize the reference contour.

4.3.2 Parameter Setting Overview



4.3.3 Parameterizing the Input Variables

see Section *4.2.2*

The parameters for belt velocity, bulk goods density and, if necessary, mass flow (only for output of the current bulk goods density), should be set in the "Measurement" tab in the "Parameters / Edit parameters" menu.

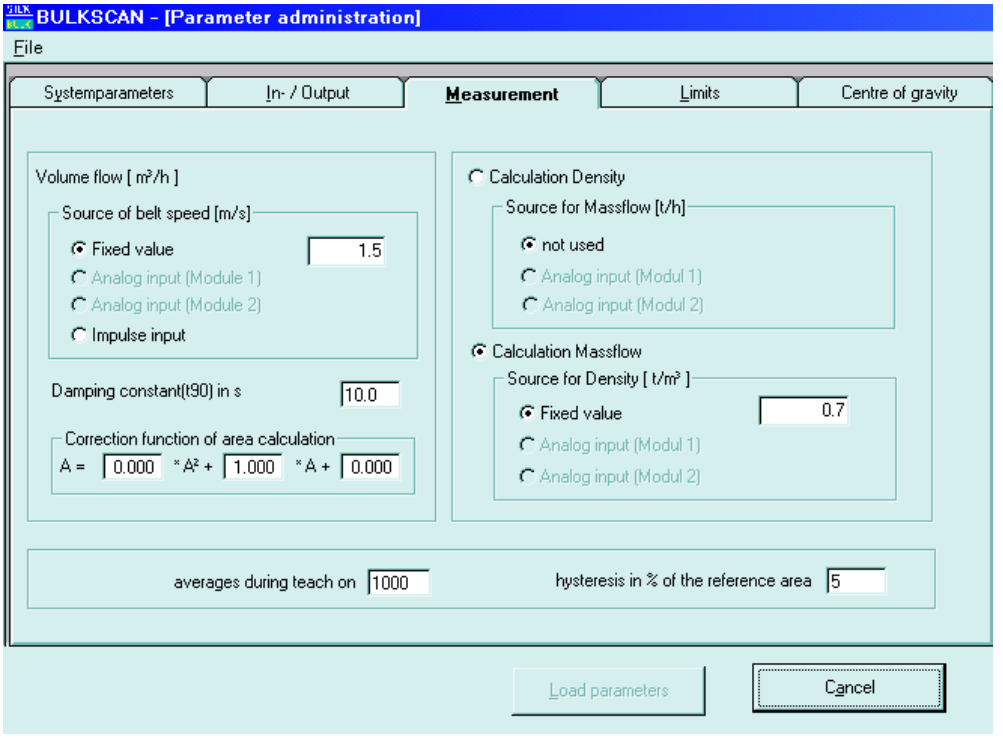


Fig. 4.12: "Measurement" tab

Parameter	Source	Remark
Convyoer belt speed (field "Volume flow")	Constant value	Can be set when the belt runs with a constant speed. Belt movement must be indicated by a 24 V DC status signal (terminals 20, 19 in the evaluation unit; see Section *3.3.2*).
	Analog input	Can be selected if an analog source is available (e.g. tachometer generator)
	Impulse input	Selection if a pulse generator is available. Here the number of pulses per conveyor belt metre should be given. The time gap between two pulses is measured and calculated to the current belt velocity using the parameterized number of pulses per metre of belt. To suppress interference pulses from the pulse generator, the limit frequency of a low pass filter can be parameterized.
Mass flow (field "Calculation density")	Analog input	Selection if an analog source for the mass flow is available
Bulk goods density (field "Calculation mass flow")	Constant value	Can be set if the density is constant (e.g. for the calculation of the volume flow)
	Analog input	Can be selected if an analog source for the bulk goods density is available

The parameters set should be transferred to the evaluation unit by clicking on the button "Set parameters".

Note To use analog input signals an optional analog module must be available. It has to be parameterized as an input using the "In-/Output" tab in the "Parameter / Edit parameters menu, and the values for lower measuring range limit (input field "Minimum"), upper measuring range limit (input field "Maximum") and Live Zero (0/2/4 mA) has to be set.

4.3.4 Parameterizing the Output Variables

The desired measuring variable can be output as an analog and/or impulse signal.

see Section *4.2.2*

To parameterize the variable, select the "In-/Output" tab in the "Parameter / Edit parameters menu.

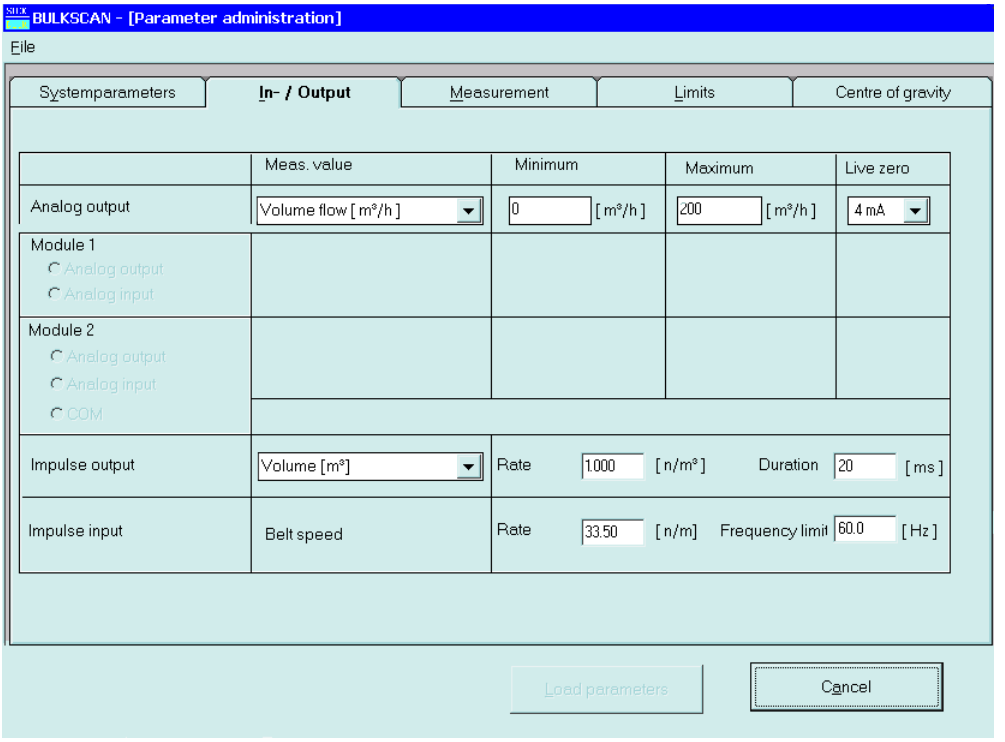


Fig. 4.13: "In-/Output" tab

Analog output

- Select the measuring value to be output in the input field "Meas. value".
- Assign the lower measuring range limit (input field "Minimum") and the upper measuring range limit (input field "Maximum") to the output current (Live zero to 20 mA).
- Define the Live Zero value (0, 2 or 4 mA).

Impulse output

- Select the measuring value to be output in the input field "Meas. value"
- Parameterize the number of pulses per measuring unit of the selected variable (input field "Rate" and the pulse duration in ms.

Transfer the altered parameters to the evaluation unit by clicking on the "Set parameters" button.

4.3.5 Center of Gravity

To output the measuring variable "Center of gravity", set the value 'Minimum' to 0 and the value 'Maximum' to 1 (see .**Fig. 4.14**). Then choose the tab page "Center of gravity", activate the gravity center calculation and adjust the attenuation constant (see **Fig. 4.15**). The Live Zero value can be set to 0, 2 or 4 mA.

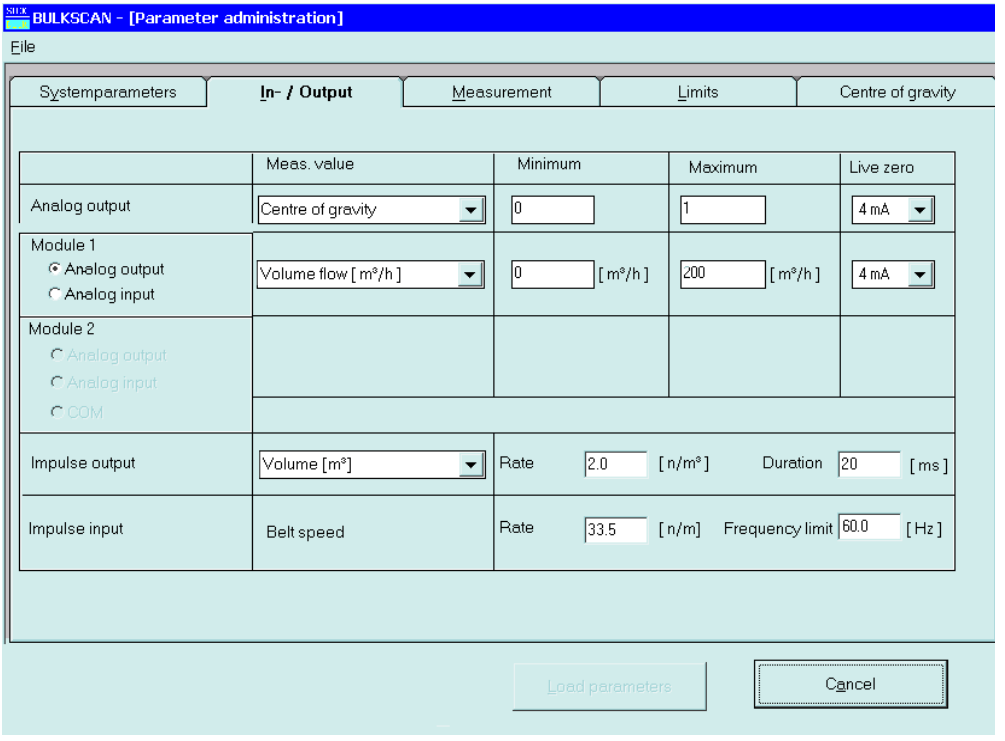


Fig. 4.14: "In-/Output" tab

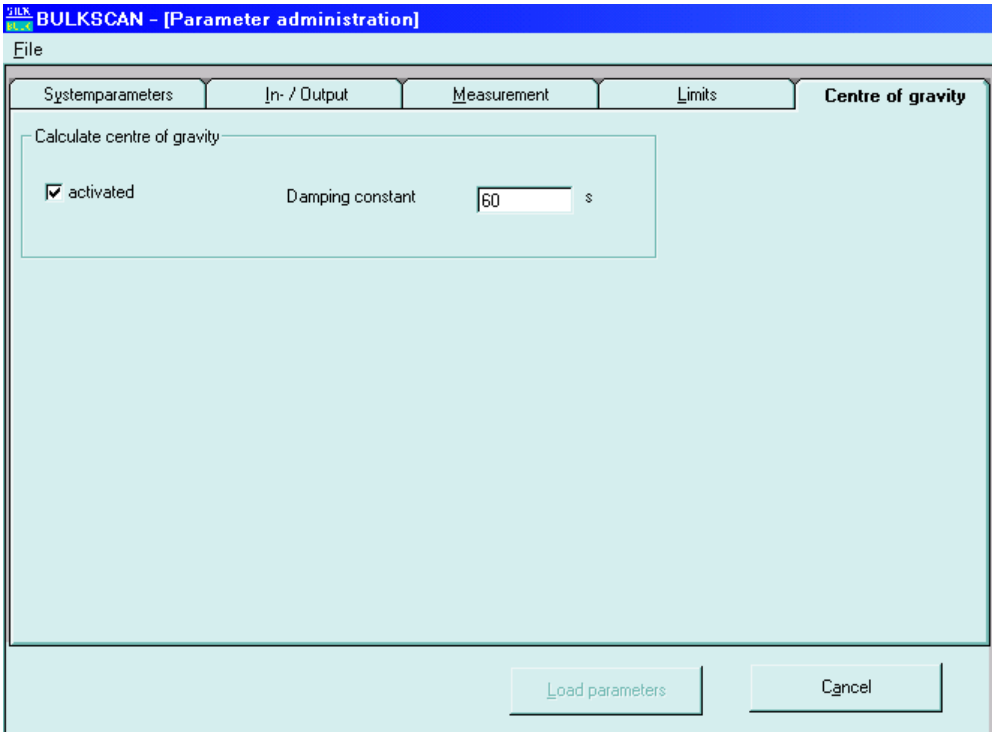


Fig. 4.15: "Center of gravity" tab

4.4 Examples for Possible Parameter Settings

The following examples explain the programming options for measuring tasks which could be expected in practice. The figures show typical settings for the input and output variables, measured value parameters and limit values.

4.4.1 Example 1 (Standard Use)

Here the volume flow is asked for. It is output via the analog output. The required input variable, i.e. the belt velocity, is read into the device via an analog input or a pulse transmitter. The impulse output is not used.

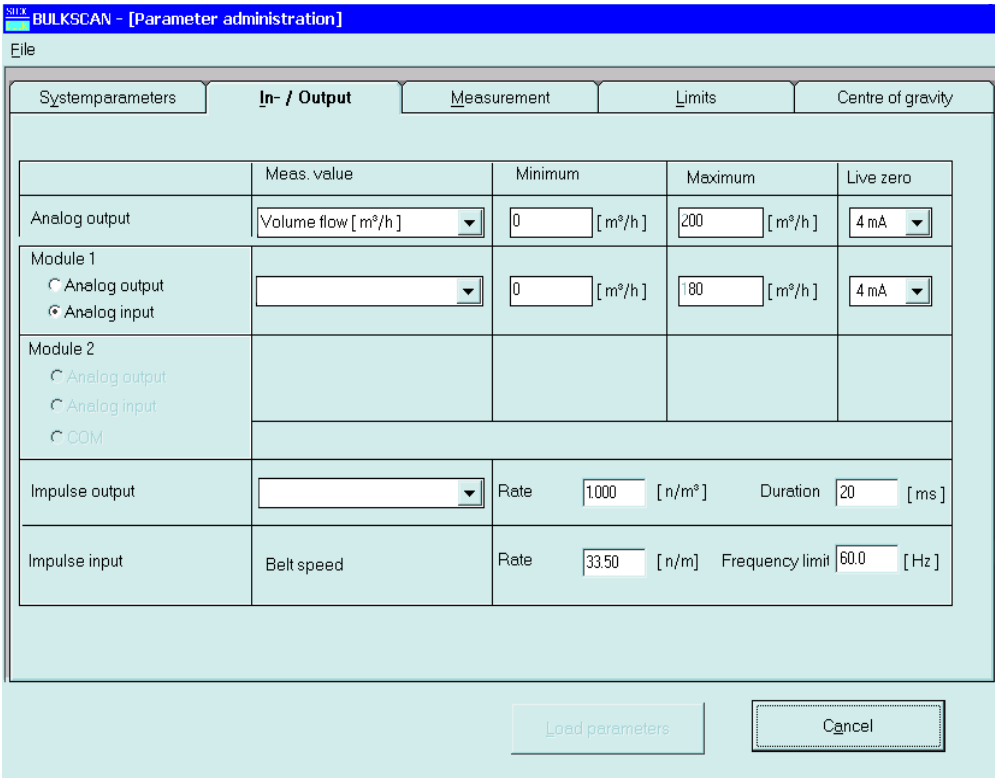


Fig. 4.16: "In-/Output" tab

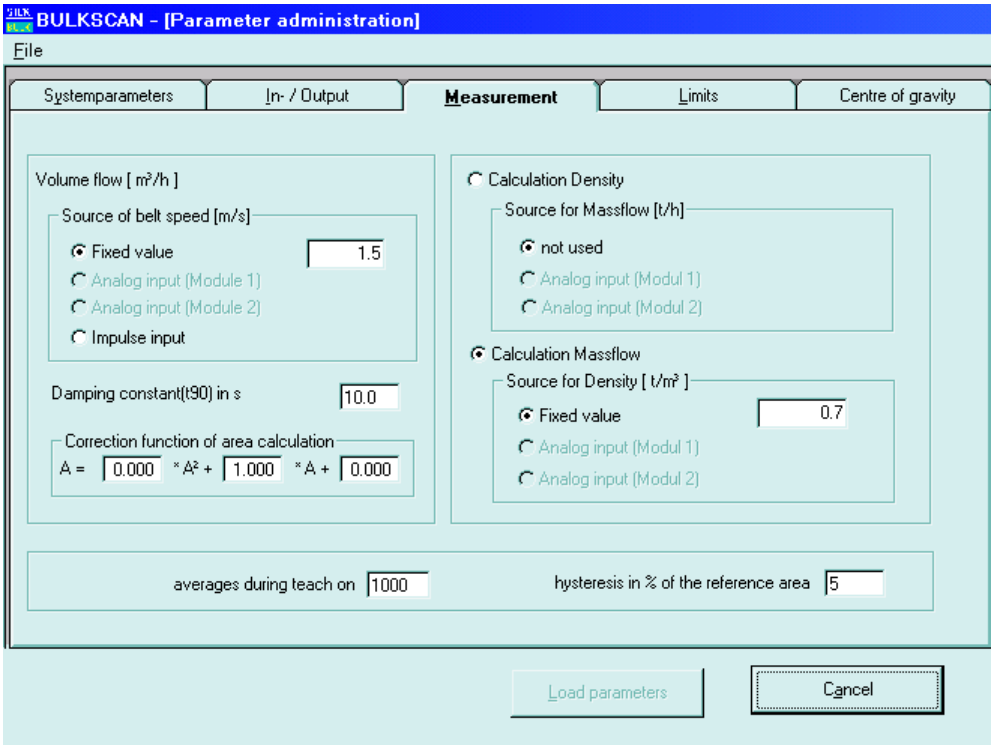


Fig. 4.17: "Measurement" tab

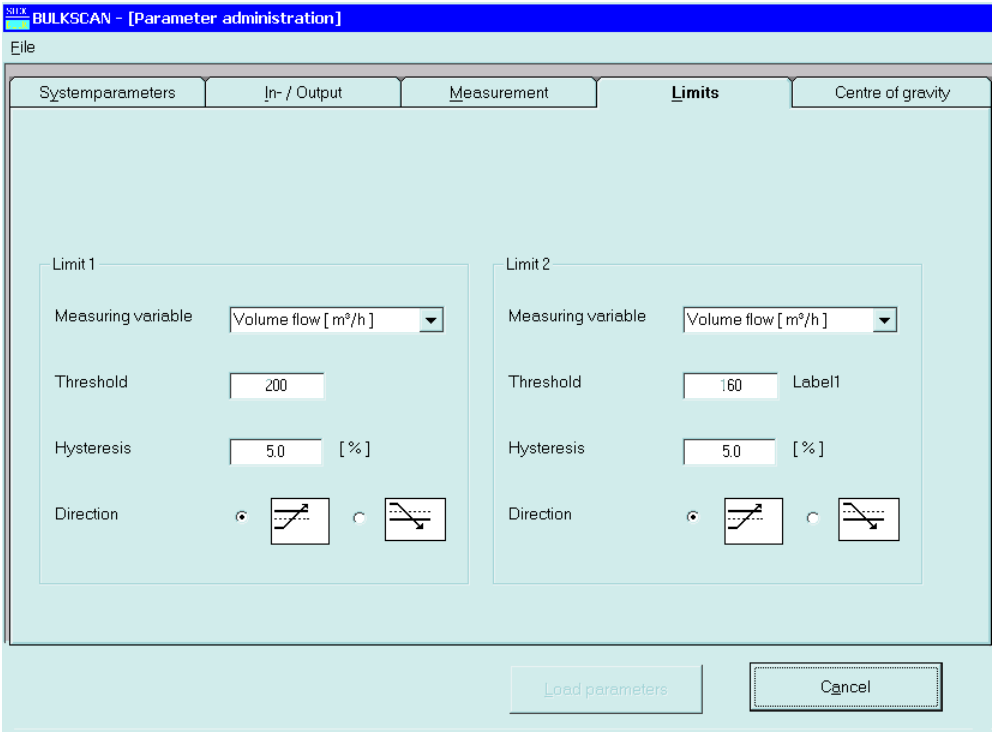


Fig. 4.18: "Limits" tab

4.4.2 Example 2

In this case the mass flow is output via the analog output and the volume via the impulse output. The input variables required are the bulk goods density (via analog input) and the belt velocity (with the pulse generator).

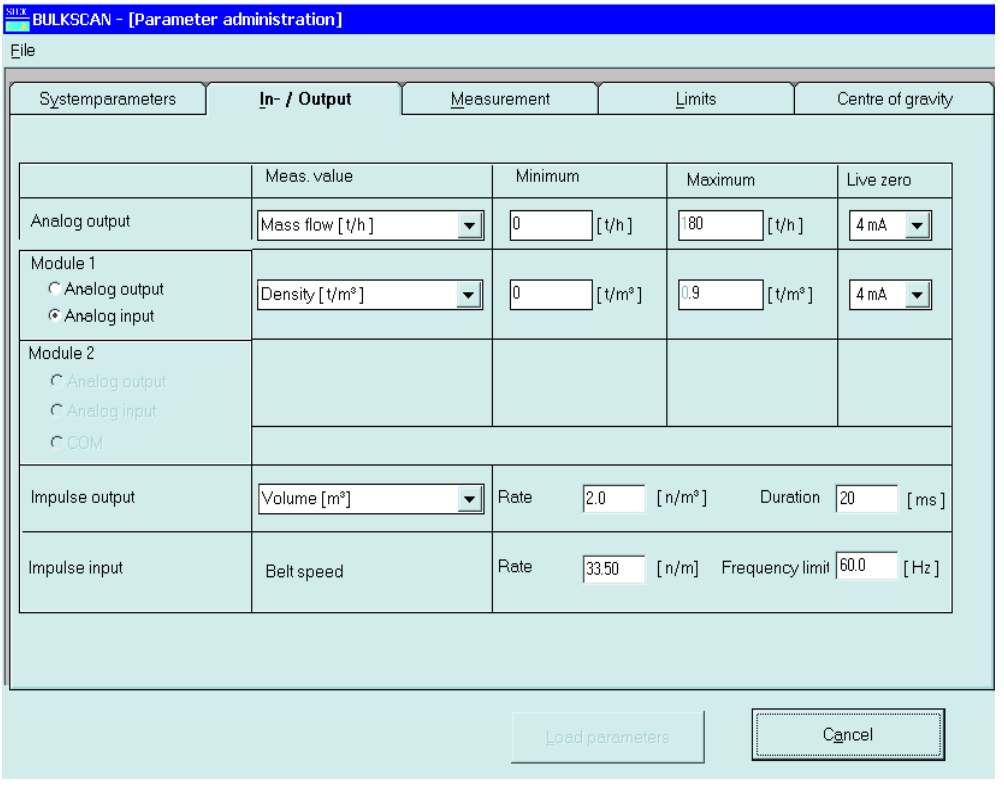


Fig. 4.19: "In-/Output" tab

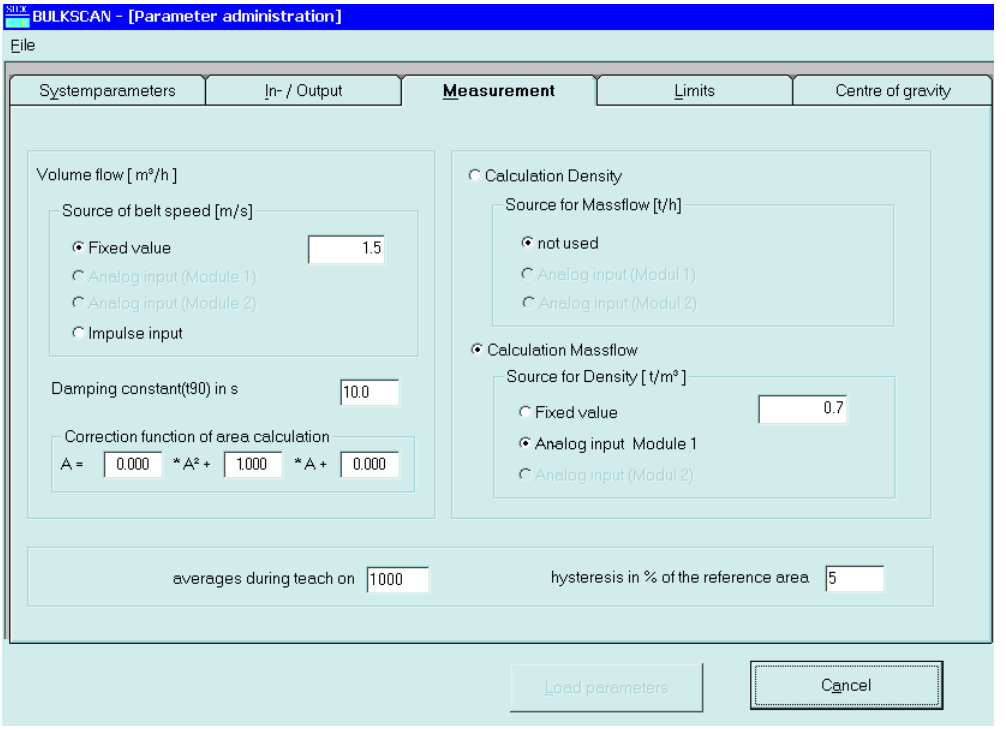


Fig. 4.20: "Measurement" tab

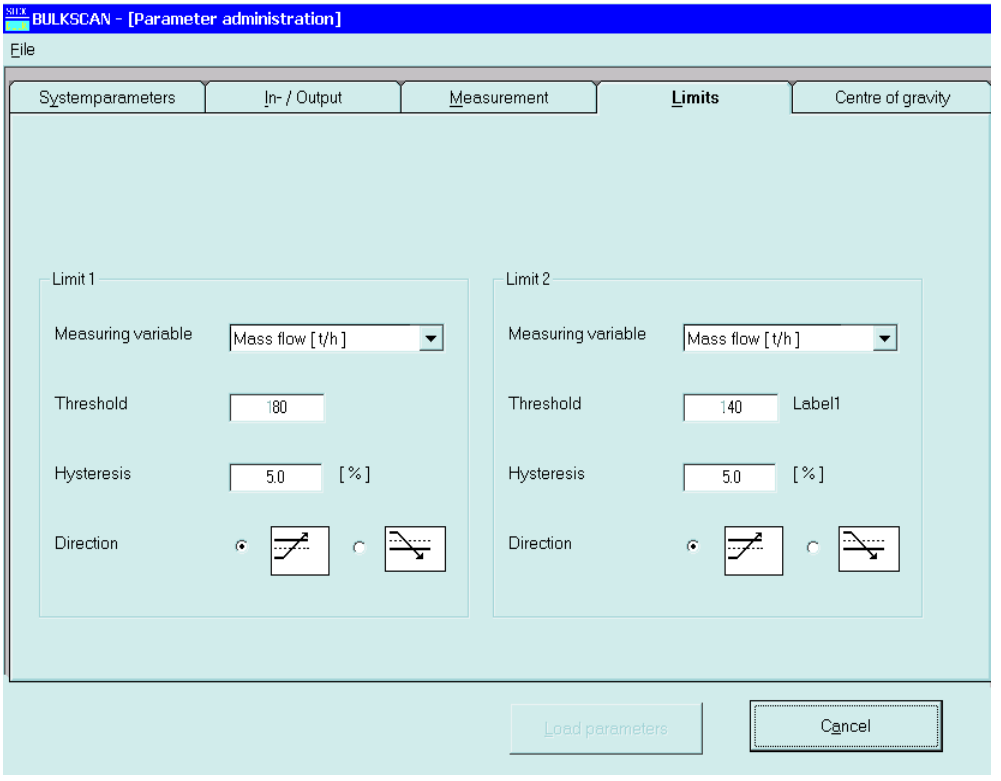


Fig. 4.21: "Limits" tab

4.4.3 Example 3

The output variables are the bulk goods density and the total volume. To do this the analog output must be set for the bulk goods density and the impulse output for the volume output. The mass flow (via the analog input) and the belt velocity (with the pulse generator) are required as input variables.

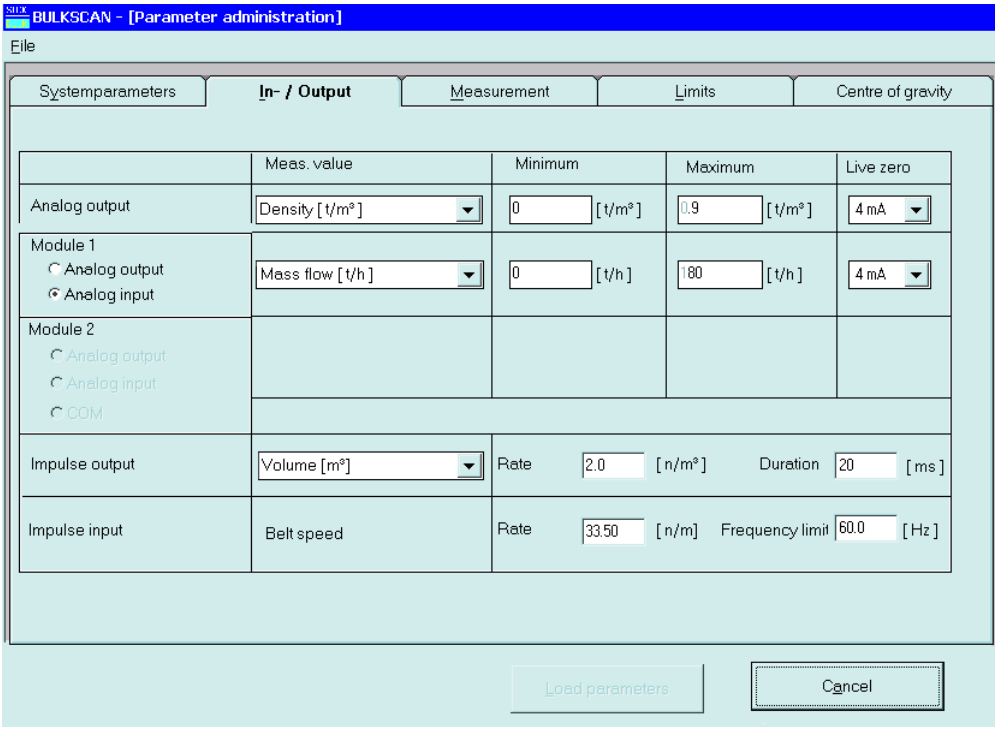


Fig. 4.22: "In-/Output" tab

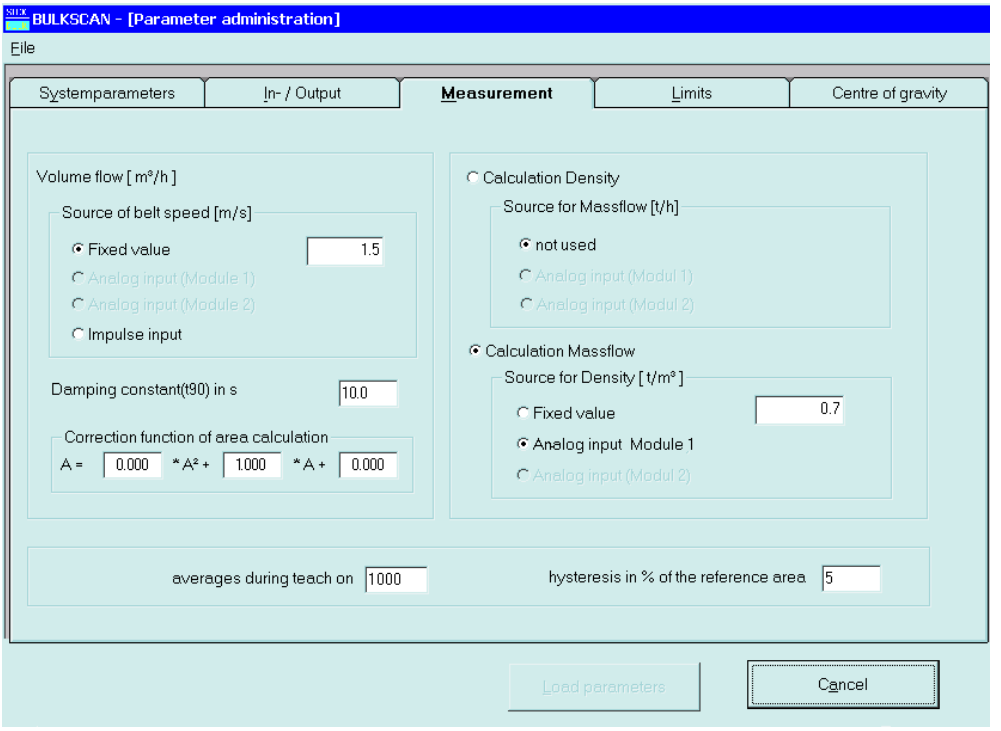


Fig. 4.23: "Measurement" tab

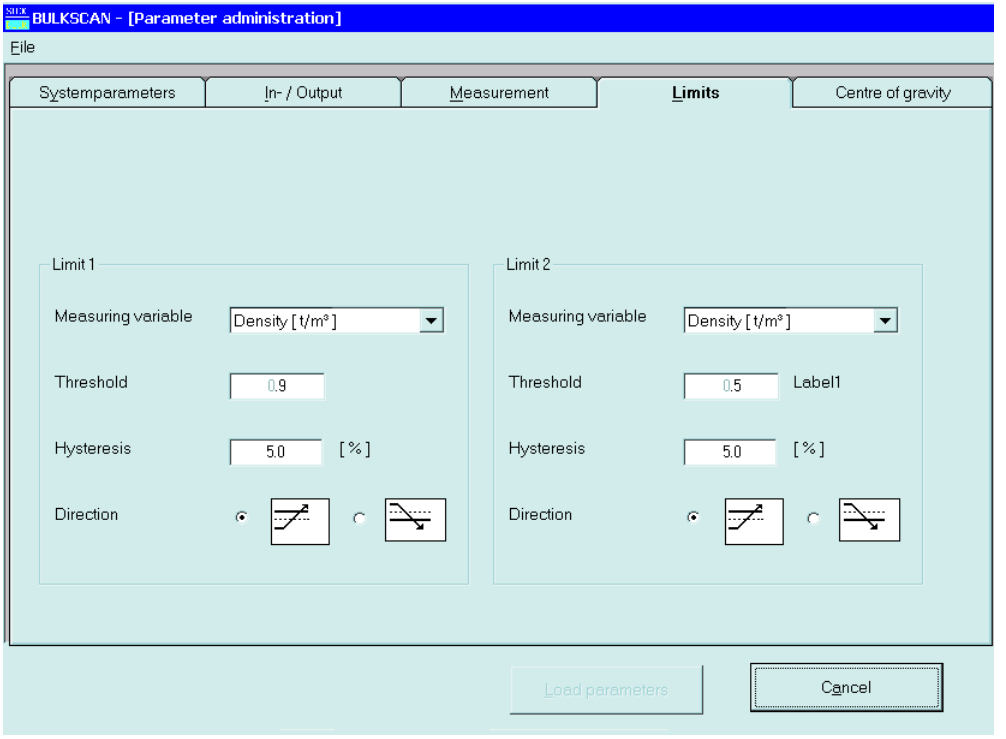


Fig. 4.24: "Limits" tab

4.4.4 Example 4

In this case the volume flow and the total volume are required. The volume flow is assigned to the analogue output and the volume to the impulse output. The bulk goods density is set as a constant parameter, the belt velocity is read in via a pulse generator.

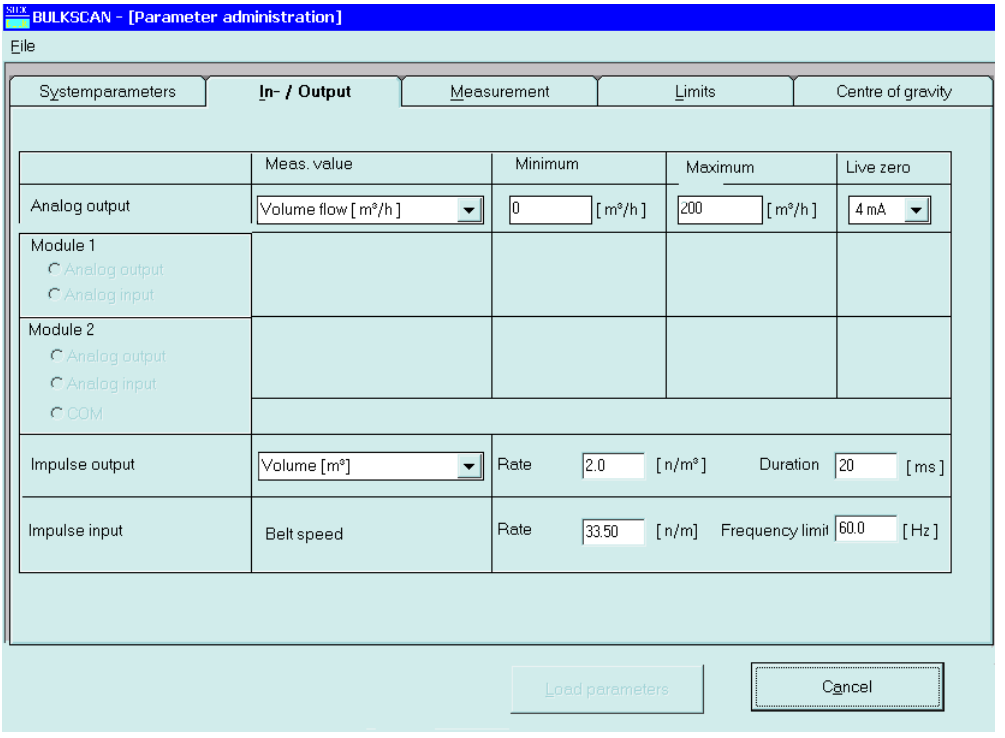


Fig. 4.25: "In-/Output" tab

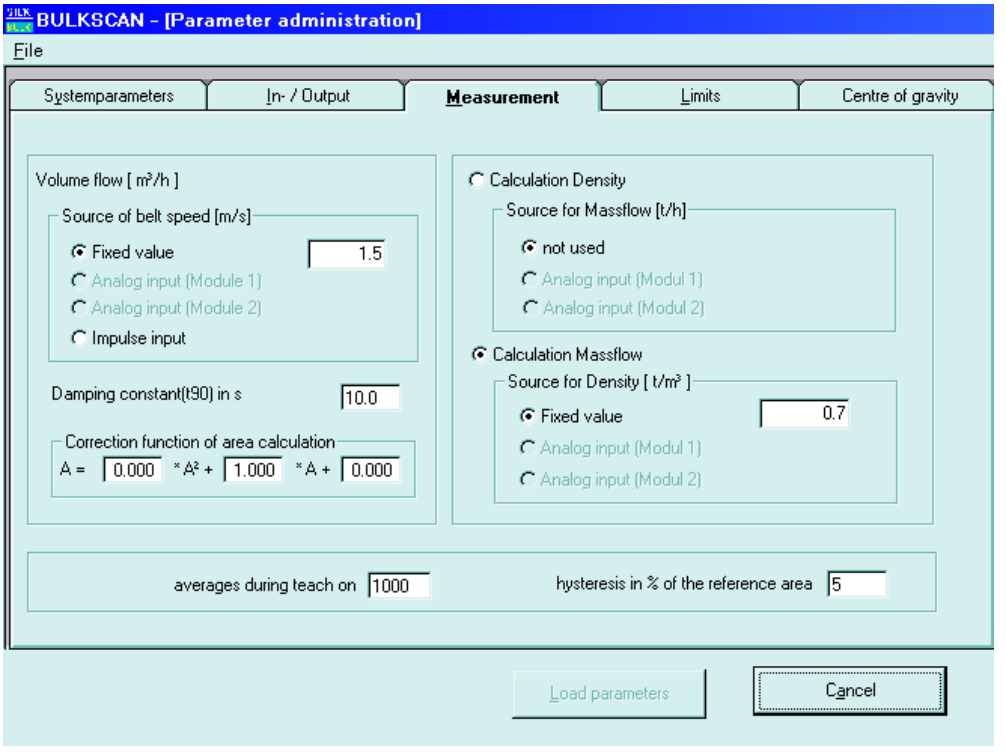


Fig. 4.26: "Measurement" tab

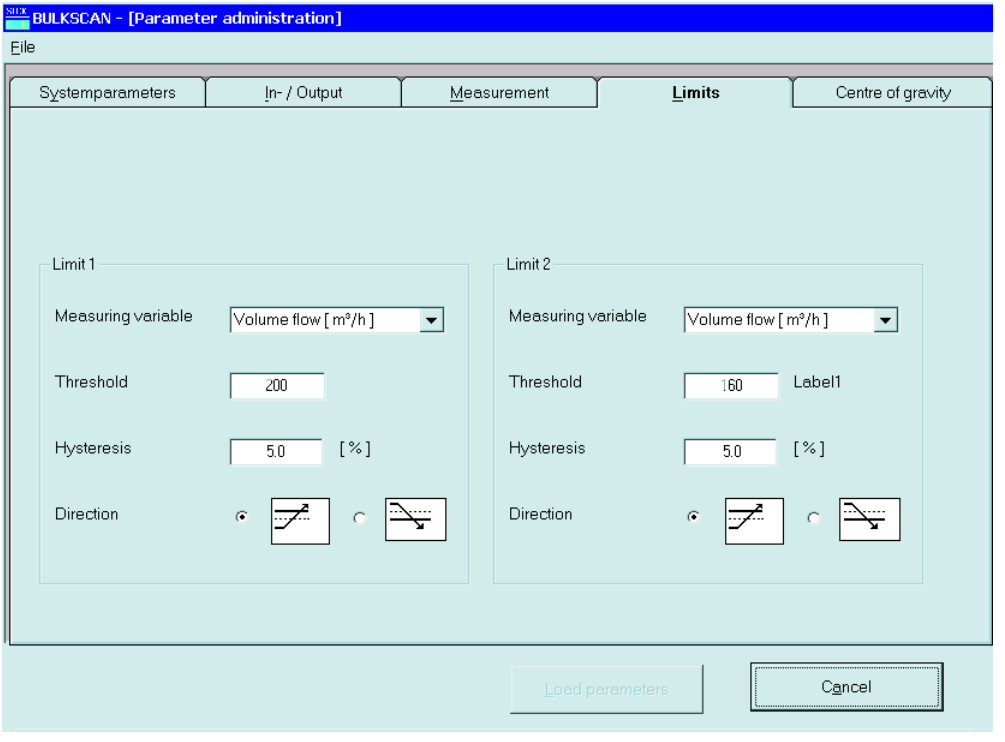


Fig. 4.27: "Limits" tab

4.5 Calibration Procedure

4.5.1 General Notes

Depending on the specific ambient conditions at the BULKSCAN installation location, systematic errors in the determination of the volume flow can occur. Because these errors lead to reproducible deviations under the same external conditions, they can be separated from the volume flow value if the system is calibrated. Therefore we recommend in any case to calibrate the measuring system to increase the measuring precision. The system can be calibrated either for the nominal volume flow or for the volume flow range (increased expense).

The BULKSCAN determines the actual cross-sectional area by scanning the bulk good profile. Using the conveyor belt velocity, the volume flow can be calculated (see Section *2.2.2*). Because systematic errors appear as a deviation in the measured area, a calibration delivers corresponding correction factors that will be entered into the measuring system using the operation program.

Requirements to avoid measuring errors

- Minimum height of the bulk goods 200 mm
- Constant conveyor belt velocity during calibration
- Constant bulk density and bulk material density
- Unchanged color of the bulk material
- The installation location fulfills the requirements in Section *3.2.1* (optimal installation height, no vibrations of conveyor belt and LMS etc.)
- Conveyor belt variations with loads < 5 mm

4.5.2 Calibration

A reference measuring system with an accuracy of ±1% referred to the upper limit of the measuring range is required. Usable are, for example:

- Plant for packing the bulk goods
  The bulk density and bulk material density must be the same for the bulk goods on the conveor belt and in the packaging.
- A Container with straight contours that is filled with the bulk good so that the volume can be determined easily.

Calibrating the measuring system with reference to the nominal volume flow

This procedure can be used for plants that are operated with a relatively constant volume flow (maximum deviation of the nominal volume flow ± 25 %).

a) **Procedure using the MEPA BULKSCAN program:**

see Section *4.1.3*

- ▶ Start the operating program, connect it with the measuring system and select the menu "Parameter / Edit parameters".
- ▶ Enter the password and open the "Measurement" tab (see Section *4.3.3*).
- ▶ Enter the parameter "hysteresis in %of the reference area" so that the volume flow is displayed as 0 m³/h when the conveyor belt is empty (2 to 5% is recommended).
- ▶ Switch to measuring mode and start the calibration submenu in the "Parameter" menu.

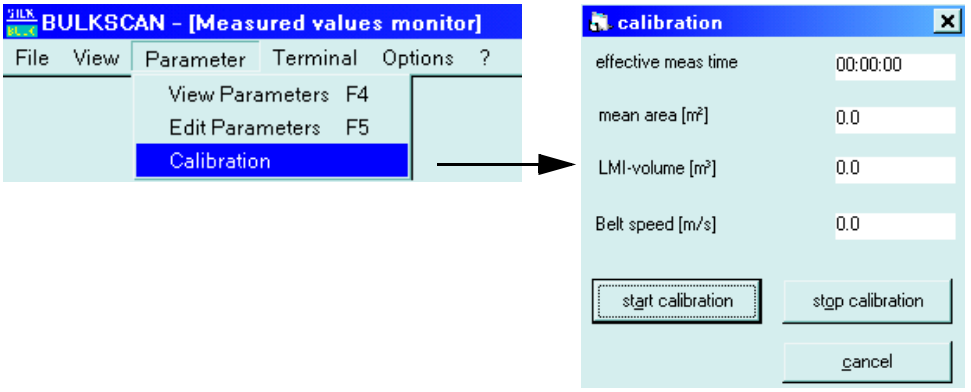


Fig. 4.28: Starting the calibration

- Click on the button "start calibration".
- Load a defined volume ("reference volume") onto the conveyor belt (e.g. from a measuring container) and let pass it completely under the laser scanner.
- Click on the button "stop calibration".
- Compare the reference volume with the value "LMI-volume [m³]" measured by the BULKSCAN (see **Fig. 4.28**).
- If deviations occur between both values, determine the correction factor cc1 according to equation (1), and enter it into the calibration equation (2) in the "Measurement" tab (cc2 und cc0 stay at 0) :

see **Fig. 4.6**

$$cc1 = \frac{\text{Reference volume}}{\text{LMI-volume}} \qquad (1)$$

$$A = cc2 \cdot A^2 + cc1 \cdot A + cc0 \qquad (2)$$

Note If a defined mass is available instead of a defined volume, it can be calculated into a volume if the bulk goods density is known and constant:

$$\text{Volume} = \frac{\text{Mass}}{\text{Bulk goods density}}$$

b) Procedure using the LMI keys:

- Start the operating program, connect it with the measuring system and select the menu "Parameter / Edit parameters".
- Enter the password and open the Measurement" tab.
- Enter the parameter "hysteresis in %of the reference area" so that the volume flow is displayed as 0 m³/h when the conveyor belt is empty (2 to 5% is recommended).
- Switch to measuring mode.
- Using the SET key on the LMI select "Reset counter" and set the counter to zero using the ↵ key.
- Load a defined volume ("reference volume") onto the conveyor belt and let pass it completely under the laser scanner.
- Using the SET key select the volume measured by the BULKSCAN ("LMI-volume [m³]") and compare it with the reference volume.
- If deviations occur between both values, determine the correction factor cc1 as described before, and enter it into the calibration equation.

Calibrating the measuring system with reference to the volume flow range

This method has to be used if bulk goods are transported in the plant with different volume flows within a known range. In this case the calibration requires to record the measuring data of reference system and BULKSCAN for several volume currents that have to be adjusted in this range. Then the correction factors have to be determined.

Procedure:

- Start the operating program, connect it with the measuring system and select the menu "Parameter / Edit parameters".
- Enter the password and open the "Measurement" tab.
- Enter the parameter "hysteresis in %of the reference area" so that the volume flow is displayed as 0 m³/h when the conveyor belt is empty (2 to 5% is recommended).
- Switch to measuring mode and start the calibration submenu in the "Parameter" menu.
- Click on the button "start calibration".
- Load a defined volume ("reference volume") onto the conveyor belt (e.g. from a measuring container) and let pass it completely under the laser scanner.
- Click on the button "stop calibration".

see **Fig. 4.28**

- Enter the measured values "effective meas. time", "mean area", "belt speed", and the reference volume into a table (see example).
- Repeat the comparison measurement with further, different volume flows within the range.
- Determine the value "Calculated area" from reference volume, belt speed and effective measuring time for every measurement according to the following formula, and enter it in the table.

$$\text{Calculated area} = \frac{\text{Reference volume [m}^3\text{]}}{\text{eff. meas. time [s]} \bullet \text{belt speed [m/s]}}$$

- Then calculate a regression function from the values "mean area" and "Calculated area" as a polynomial 2nd order, and enter the regression coefficients cc2, cc1 and cc0 into the calibration equation in the "Measurement" tab.

Example:

Measurement	'effective meas. time' [s]	'mean area' [m²]	Reference volume [m³]	'belt speed' [m/s]	Calculated area [m²]
0	3600	0.00000	0.0000	1	0.00000
1	3600	0.00160	6.0000	1	0.00167
2	3600	0.00200	7.5000	1	0.00208
3	3600	0.00300	12.5000	1	0.00347
4	3600	0.00400	17.5000	1	0.00486
5	3600	0.00500	21.2500	1	0.00590
6	3600	0.00700	23.0000	1	0.00639
7	3600	0.00800	27.5000	1	0.00764
8	3600	0.00900	34.0000	1	0.00944
9	3600	0.01200	41.0000	1	0.01139
10	3600	0.01400	50.0000	1	0.01389

Notes

- Because the volume flow on an empty conveyor belt must always be 0 m³/h, a line must be entered in the table with zero values (measurement 0) to be included in the following regression calculation.
- To illustrate the relations, the values "mean area" and "Calculated area" can be used to draw a diagram (see **Fig. 4.29**).
- The EXCEL program from Microsoft can be used to evaluate and calculate the calibration factors.

  Procedure:

  1. Prepare the table with the measured data.
  2. Make a point (X Y) diagram from the columns "mean area" and "Calculated area".
  3. Insert a trend line (polynomial of 2nd order)
  4. Mark the point "insert formula in diagram" in the trend line options menu.

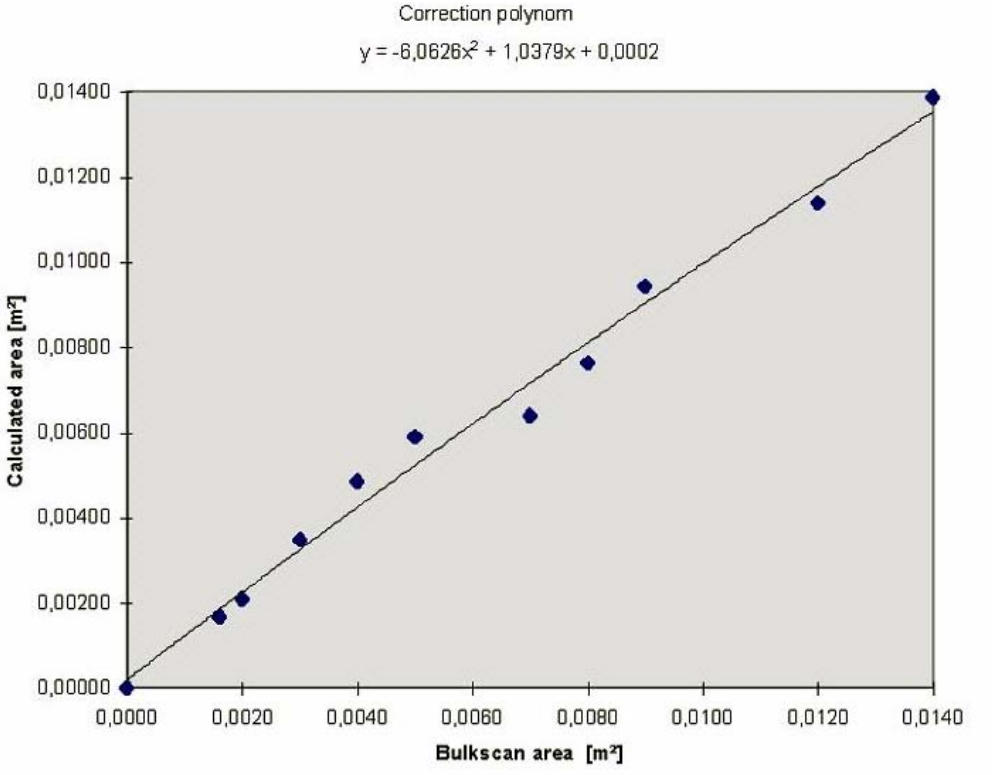


Fig. 4.29: Diagram with regression line and calibration equation

BULKSCAN

Conveyor Belt Monitor

Maintenance

General

Maintening optional Purge-Air Units

5 Maintenance

5.1 General

Maintenance work

The routine work generally consists of checking the cleanness and cleaning dirt from the outside of system components. If a purge-air unit is used, in addition it's required to inspect the whole purge-air supply, clean the filter housing, and replace the filter insert if necessary.

Maintenance mode

Before you carry out maintenance work, you have to set the measuring system to maintenance mode using the MEPA BULKSCAN program (see Section *4.2.1*). Once you have completed these activities, switch the system back to measuring mode.

Maintenance intervals

Maintenance work must be planned and carried out at regular intervals. The maintenance intervals vary from plant to plant and depend on the local conditions. For this reason only general recommendations can be given here. As a rule, maintenance intervals amount to more than 6 weeks.

The activities required and their completion must be documented by the operator in a maintenance log.

Maintenance contract

Regular maintenance work can be carried out by the plant operator. In accordance with Chapter 1, only qualified personnel may be authorised to do this work. The complete maintenance can also be taken over by SICK MAIHAK service or by authorised service centres, on request. SICK MAIHAK offers maintenance and repair contracts at favourable prices and, within the scope of such agreements, SICK will undertake all maintenance and servicing work. Repairs by specialists are carried out on site whenever possible.


DANGER

Warning

All installation work must be carried out in line with the relevant safety regulations and instructions listed in Section *1.3* (especially Section *1.3.3*).

Maintening the iaser scanner

At every maintenance the housing and particularly the sensor window and the reflector foil underneath the window (LMS211 sensor only) have to be cleaned.


ATTENTION

Important

The cleaning of the transparent surface may only be cleaned using water and a small amount of cleaning agent. Scratches on the front pane should be avoided as they may cause errors in the reflecting system!

5.2 Maintening optional Purge-Air Units

The dust load and wear on the filter insert depend on the degree of contamination of the ambient air that is drawn in. For this reason, we cannot provide specific recommendations regarding maintenance intervals. We recommend to inspect the purge-air supply in short intervalls (approx. 2 weeks) after commissioning, and then to optimize the maintenance intervals accordingly.

Inspection

- Check the running noise of the fan at regular intervals; an increased noise level can indicate a fan failure.
- Check that all the hoses are secure and free of damage.
- Check the filter insert for contamination.
  You must replace the filter insert when:
  – a high degree of contamination is visible on the filter surface
  – the purge-air quantity is considerably less than during operation with a new filter

5.2.1 Purge-Air Unit in Connection Box

Cleaning or replacing the filter insert

- Open the door of the connection unit using the appropriate key.
- Remove the clamping tape at the filter output (1) and remove the filter from the gland (2).
- Remove the filter housing.
- Turn the filter housing cover in the direction of the arrow to "OPEN" and remove it.
- Remove the filter insert and replace it with a new one.
- Clean the filter housing and housing cover with a cloth and brush.


ATTENTION

Important
You must only use a cloth soaked in water to wet-clean the components. Make sure that you dry the components thoroughly.

Spare part:
Filter insert C1140,
Part no. 7047560

- Insert the new filter insert.
- Replace the filter housing cover and turn it against the direction of the arrow until it clicks into position.
- Place the filter housing back into the connection unit.

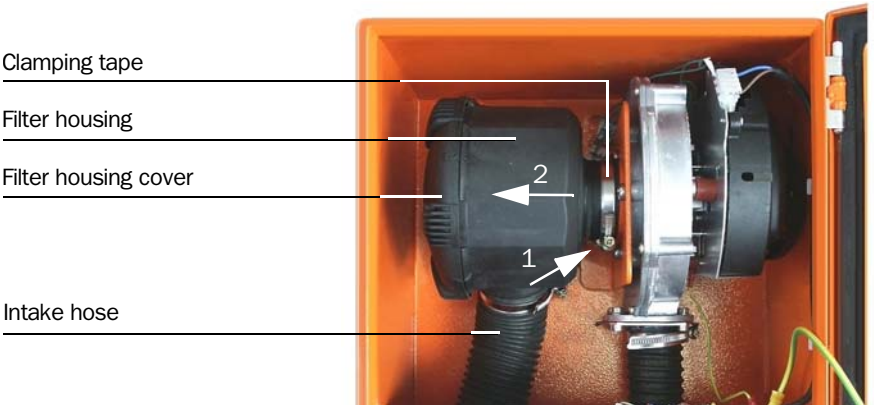


Fig. 5.1: Replacing the filter insert for purge-air supply in connection box

5.2.2 Purge-Air Unit with Fan Type 2BH1300

Important

The purge-air unit must be maintained at the very latest when the low-pressure monitor at the filter output is activated (see **Abb. 5.2**).

Replacing the filter insert

- Ensure that you have a new filter insert (2) ready.
- Loosen the hose clamp (6) on the purge-air hose (7) and remove the hose. Secure the hose onto a clean surface.

ATTENTION

Important

Attach the end of the hose in such a way that no foreign bodies can enter it (danger of destroying the fan), but do not seal it! During this time, the purge-air entering the purge-air glands is unfiltered.

- Remove any dust from the outside of the filter housing (1).
- Press the two quick-release locks (4) on the filter housing cover (3) to remove it.
- Remove the filter insert (2) by turning it counter-clockwise.
- Clean the filter housing and housing cover with a cloth and brush.

ATTENTION

Important

You must only use a cloth soaked in water to wet-clean the components. Make sure that you dry the components thoroughly.

Spare part:
Filter insert Micro-Top element C11 100,
Part no. 5306091

- Insert the new filter insert by turning it clockwise while applying pressure.
- Mount the filter housing cover and ensure that it is properly aligned with the housing. Snap the quick-release locks into position.
- Reconnect the purge-air hose to the filter outlet using the hose clamp.

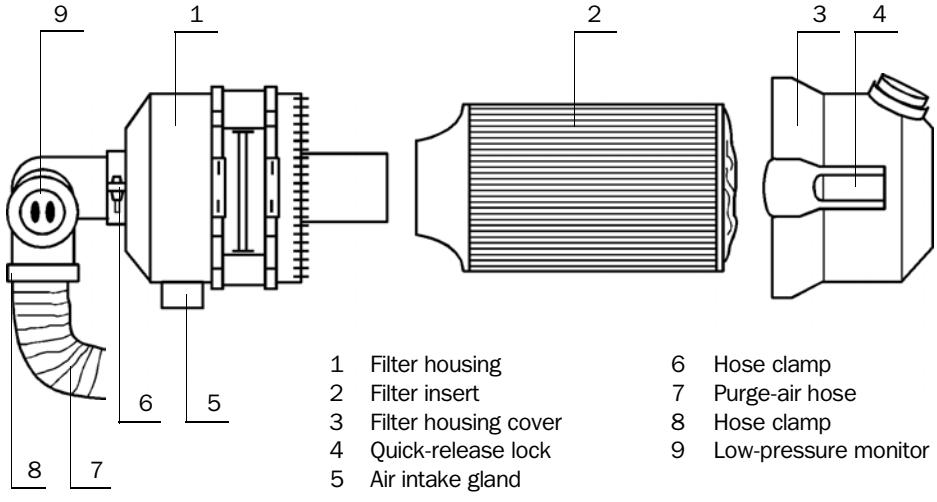


Fig. 5.2: Replacing the filter insert

BULKSCAN

Conveyor Belt Monitor

Troubleshooting

Malfunctions

Warning and Malfunction Messages

6 Troubleshooting

6.1 Malfunctions

6.1.1 No Indications or Signal Output

Symptom	Possible cause	Remedy
LEDs on evaluation unit do not light up, no indication on display	• No power supply • Fuse defective • Processor board defective • LCD defective	▶ Disconnect the device from the power supply ▶ Open the evaluation unit cover ▶ Check the fuse (see Section *7.2.1*) ▶ Check the power supply
Analog output on Live Zero	• Device is set in status "maintenance". • Device has malfunction(s).	▶ Check device status ▶ Check the device for malfunctions and remove them as far as possible. ▶ Contact SICK I Maihak service.
No analog signal or output of a fix value greater than Live Zero	D/A converter defective	Contact SICK Maihak service.

6.1.2 Measured values not plausible

Symptom	Possible cause	Remedy
Stable measured values, but conveyor belt velocity implausible	Incorrect analog or impulse signal	Check the input signal (plausible frequency, concealed interference voltages)
Conveyor belt velocity = 0	• No analog or impulse signal • When using constant velocity parameterization, no conveyor belt status signal provided	▶ Check the input signal ▶ Check the belt status signal
Measured values too high or too low	Wrong reference	▶ Check form stability of the conveyor belt ▶ Rememorise reference contour ▶ Sensor calibration may be necessary

6.2 Warning and Malfunction Messages

Warnings and device malfiunctions are signaled by switching the corresponding relay (see **Fig. 3.7**) and at the LCD on the evaluation unit.

6.2.1 Warning Messages

Indication on LCD	Possible cause	Remedy
"Data!"	File set could not be calculated, as the system is overloaded	▶ Check measured values. ▶ Cut short any additional operating or output processes.
"Warnung 0x02"	not used	
"Warning 0x04"	Pulse repetition frequency outside specification	Test the impulse signal. The impulse frequency must be between 20 Hz and the set low pass limit frequency.
"Warning 0x10"	Warning of sensor status	Clean the sensor window. For LMS211 also clean the reflector foil on the sensor.
"Warning 0x80"	Length vector outside the plausibility range	Check the reflectivity of the scanned surface. Memorise reference 1.

6.2.2 Malfunction Messages

The LED "Malfunction" on the evaluation unit shines while malfunctions exist. The analog output delivers the set value for "Live Zero".

Indication on LCD	Possible cause	Remedy
"Error 0x01"	• No communication with the sensor • Wrong sensor type	▶ Check the data cable between the evaluation unit and the sensor. ▶ Check parameterization of LMS (must correspond to the type plate at the scanner).
"Error 0x02"	No reference contour saved	Memorise reference
"Error 0x10"	Error in the sensor status	▶ Replace the sensor. ▶ Contact SICK MAIHAK service.
"Error 0x40"	Sensor blinded	Remove the light source from the sensor area.

BULKSCAN

Conveyor Belt Monitor

Repairs

Evaluation Unit

Optional Purge-Air Supply in Connection Unit

7 Repairs

Any repair work on the BULKSCAN is limited to replacing the system components listed under the spare parts (see *8.4*). Individual modules can only be repaired at the manufacturer.

Note Laser scanners cannot be repaired at site. In case of malfunctions or faulty send this component to the manufacturer.


ATTENTION

Important

- Repairs that are not authorized by the manufacturer may render existing warranty claims invalid!
- Disconnect the system from the power supply before replacing any parts!

Required tools:

- Socket wrenches: w/s 7 and w/s 13
- Spanner: w/s 7
- Hexagon socket screw key: w/s 3 and w/s 4
- Small and medium-sized recessed-head screwdriver
- Medium-sized flat screwdriver (for approx. 5 mm slot length)
- Medium-sized flat screwdriver (for approx. 3 mm slot length)

7.1 Evaluation Unit

7.1.1 Replacing Electronic Boards

Any defects that occur (such as overvoltage caused by lightening, impermissible voltages/ currents on the analog modules, and display problems) must be corrected by replacing the defective electronic board. **Fig. 7.1** shows how the electronic boards are arranged and secured.

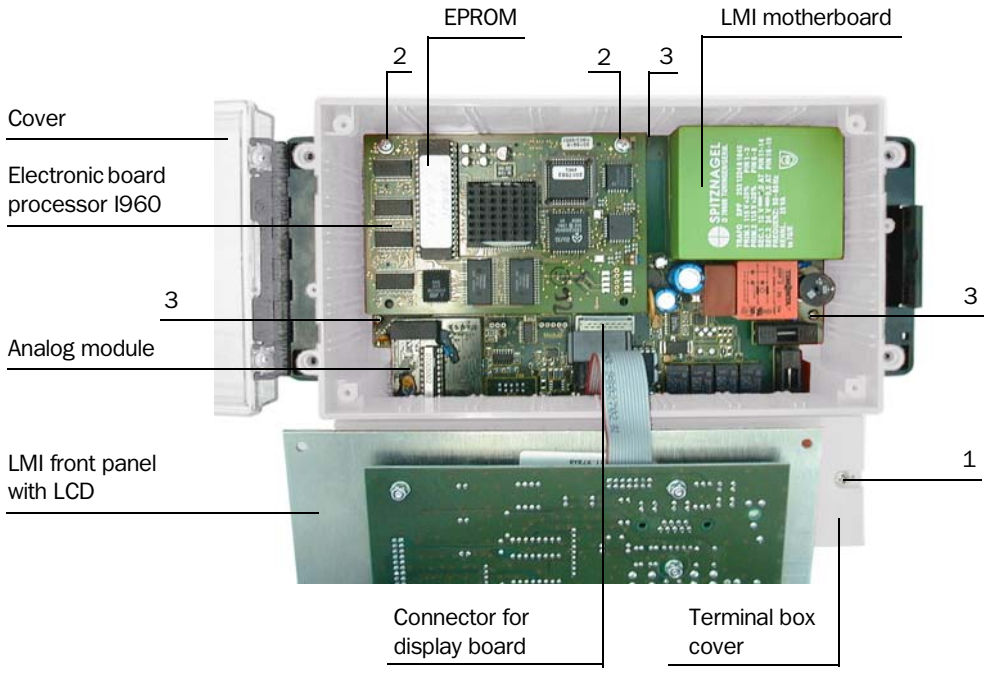


Fig. 7.1: Electronic boards in the evaluation unit

LMI front panel with LCD

Spare part:
LMI front panel with LCD,
part no. 7044010

- Loosen the 4 screws and remove the front panel. Remove the connector from the LMI motherboard.
- Connect the new front panel with LCD and screw it to the housing.
- Connect the power supply.

LMI motherboard

Spare part:
LMI motherboard,
part no. 7044011

- Loosen the screws (1) and remove the cover from the terminal box.
- Disconnect all the cables.
- Loosen the 4 screws and remove the front panel. Remove the connector from the LMI motherboard.
- Loosen the 2 screws (2) and carefully remove the electronic board processor I960 from the connectors.
- Loosen the 5 screws (3), remove the LMI motherboard from the housing and install a new board.
- Mount and secure the processor board.
- Reconnect all cables according to the wiring diagram (see **Fig. 3.7**).
- Connect and secure the LMI front panel with LCD.
- Connect and secure the cover for the terminal box.
- Connect the power supply.

Electronic board processor I960

Spare part:
Electronic board processor
I960, part no. 7041300

- Loosen the 4 screws and remove the front panel.
- Loosen the 2 screws (2) and carefully remove the electronic board processor I960 from the connectors on the LMI motherboard.
- Use a suitable tool (such as a screwdriver with a wide blade) to carefully slide the EPROM out of the holder. Connect the EPROM to a new electronic board processor as described in **Fig. 7.2**.

ATTENTION

Important
Do not bend the chip pins.

- Insert the new electronic board processor with the (old) EPROM into the connectors on the LMI motherboard and secure it.
- Connect and secure the LMI front panel with LCD.
- Connect the power supply.

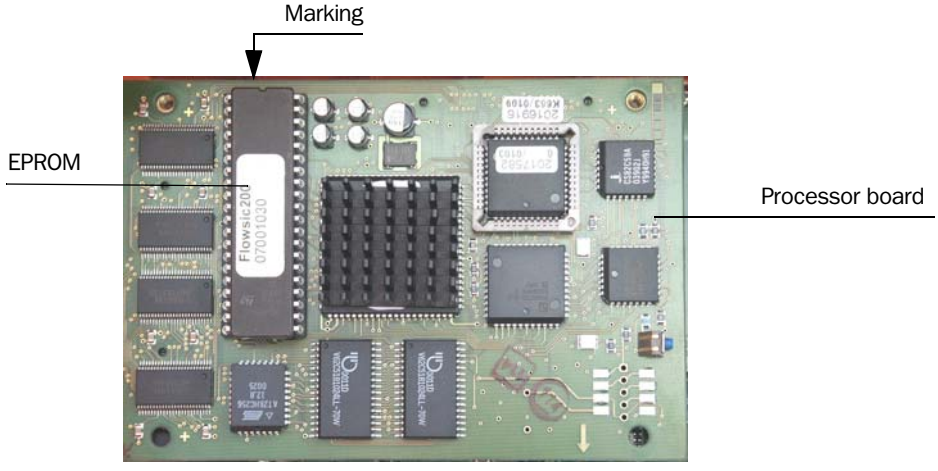


Fig. 7.2: Processor board with EPROM

7.1.2 Replacing the EPROM

Spare part:
EPROM BULKSCAN,
part no. 2039678

The EPROM must be replaced in order to update the software (bugfix, new software version).

The EPROM is located on the electronic board processor I960 that is connected to the LMI motherboard (see **Fig. 7.1**). This EPROM is replaced in the same way as the electronic board processor (**Fig. 7.2**).

The parameters must be reinitialized after the EPROM has been changed:

- Reconnect the BULKSCAN to the power supply
- Choose the "**Signal display** / **Terminal**" tab page in the MEPA BULKSCAN program and set the device to 'maintenance' mode by entering the command "GOTO MAIN".
- Set the password for parameterization to "EXPERT"
- Reinitialize the parameter set with the "RESET PARA" command.

This resets the type-specific standard parameters.

All application-specific parameters must be re-entered via the corresponding menu items in the MEPA BULKSCAN program (see Section *4.3*).

The system must be reset after parameterization has taken place. This can be done by either entering the "TEST WATCHDOG" command in the "**Signal display** / **Terminal**" tab page or by briefly disconnecting the power supply. The MEPAFLOW program must be reconnected after the system has been reset.

7.2 Optional Purge-Air Supply in Connection Unit

Notes The filter has to be replaced as described in Section *5.2.1* (part no. 7047560).

7.2.1 Replacing the Fuse

Fine-wire fuse T1A
(5 x 20 mm)

- Open the cover of the connection unit.
- Fold out the fuse holder and open the cover.
- Remove the defective fuse and install the new one.
- Close and secure the fuse holder.
- Close the cover and reconnect the power supply.

7.2.2 Replacing the Power Supply Unit

Spare part:
24 V 60 W power supply unit (part no. 7047557)

- Open the cover of the connection unit.
- Loosen the securing bolts for the power supply unit (1).
- Loosen the securing bolts for the mounting plate (2).
- Loosen the conduit threads and push the connection cable a small distance into the connection unit.
- Fold out the mounting plate and disconnect the wires.
- Loosen the retaining bolts (3) and remove the power supply unit.
- Insert and connect the new power supply unit (see **Fig. 7.3**) and reassemble the connection unit by carrying out the above steps in reverse order.
- Close the cover and connect the power supply.

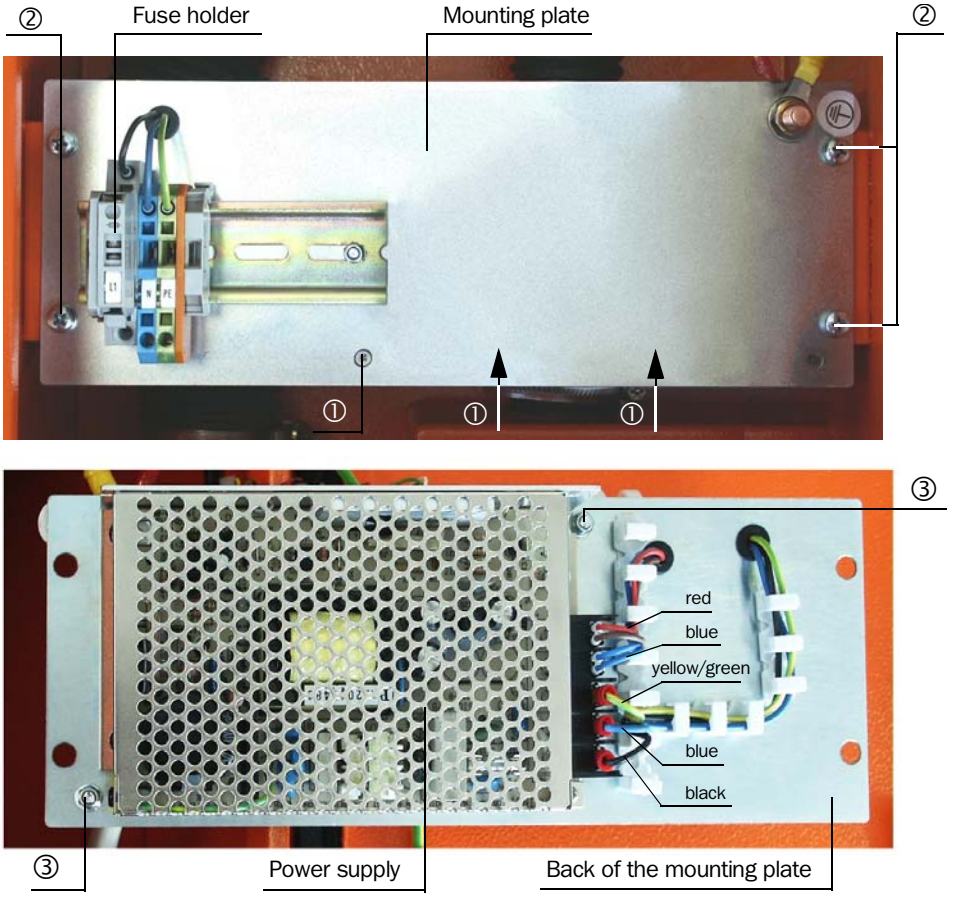


Fig. 7.3: Mounting plate with power supply unit

7.2.3 Replacing the Fan

Spare part:
Fan, part no. 7047042

- Disassemble the filter housing (see Section *5.2.1*)
- Remove the fan connector and protective conductor (see **Fig. 7.4**)
- Loosen the securing bolts.
- Remove the clamping tape and disconnect the purge-air hose.

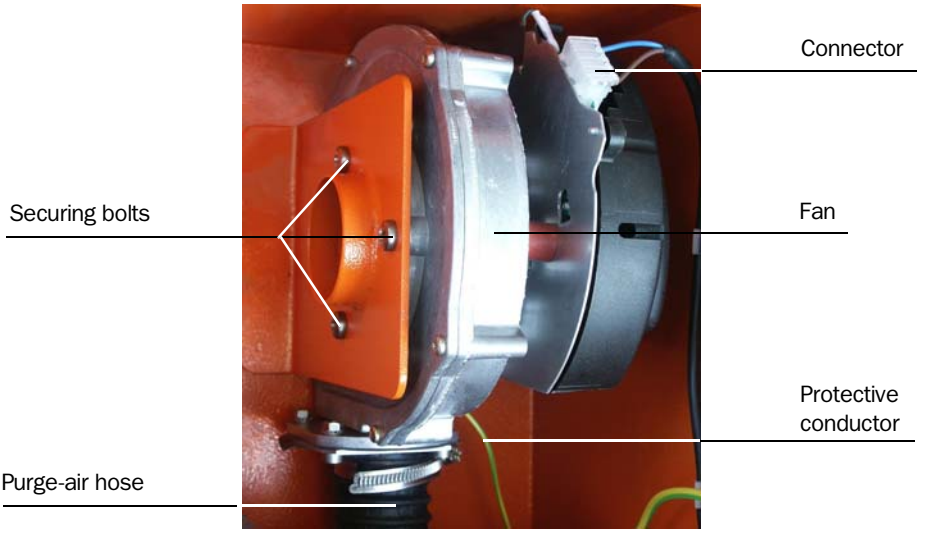


Fig. 7.4: Fan in the connection unit with an integrated purge-air supply

- Take out the fan and remove the connection plate with the seal from the purge-air outlet (see **Fig. 7.5**).
- Install and connect the new fan by carrying out the above steps in reverse order.

ATTENTION

Important
Do not forget the connection for the protective conductor.

- Install and connect the filter housing.
- Close the cover and connect the power supply.

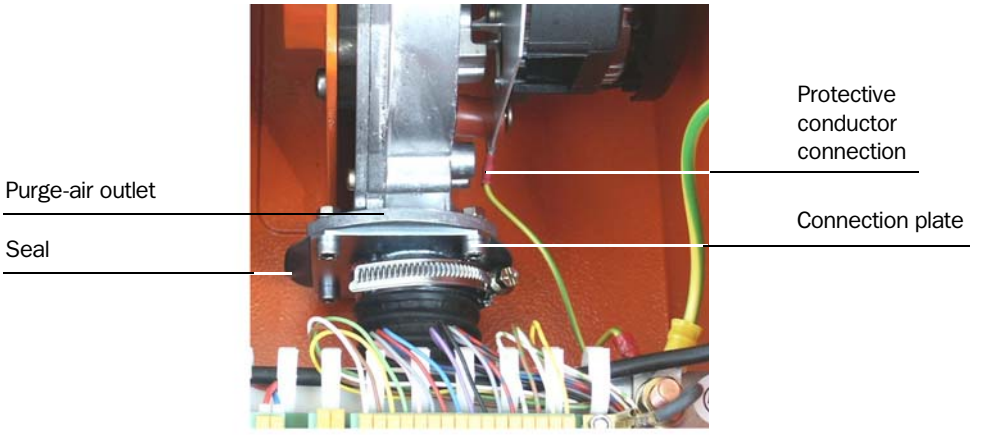


Fig. 7.5: Fan purge-air outlet

BULKSCAN

Conveyor Belt Monitor

Parts Overview

Standard Components

Options

Consumable Parts for 2-Year Operation

Spare Parts

8 Parts Overview

8.1 Standard Components

8.1.1 BULKSCAN

Name	Part number
BULKSCAN200 consisting of LMS200-30106 laser scanner indoor (1029095) and LMI101 evaluation unit (7044000)	1016261
BULKSCAN211 consisting of LMS211-30106 laser scanner outdoor (1029096) and LMI101 evaluation unit (7044000)	1013871
BULKSCAN221 consisting of LMS221-30106 laser scanner outdoor (1029097) and LMI101 evaluation unit (7044000)	1016053

8.1.2 Mounting Material for LMS

Name	Part number
Laserscanner LMS200	
Mounting set 1	2015623
Mounting set 2	2015624
Mounting set 3	2015625
Laserscanner LMS211/221	
Mounting set for wall mounting, adjustable	2018303

8.2 Options

8.2.1 Laser Scanner

Name	Part number
LMS200 laser scanner	
Dust protection indoor	7044002
LMS211 laser scanner	
Dust prevention shield grey	2025793
Dust protection shield with flap	2018306
LMS211/221 laser scanner	
Mast attachment set (mounting set required)	2018304
Tightening strap (yard good)	5306222
Lock for tightening strap	5306221
Weatherproof cover for LMS220/221	4034559
Dust protection outdoor	7044003

8.2.2 Evaluation Unit

Name	Part number
Analog module	7042020
Interface module	7042021
Module Profibus DP	7044183
Weatherproof cover for evaluation unit	4029146

8.2.3 Purge-Air Supply

Name	Part number
Purge-air unit with fan type 2BH1300	
Purge-air unit SLV4-21112 with purge-air hose, length 10 m	1012409
Purge-air unit SLV4-21111 with purge-air hose, length 5 m	1012424
Weatherproof cover for purge-air unit	5306108
Purge-air unit in connection box	
SLV-AK 230 V AC	7040289
SLV-AK 24 V DC	1029127

8.2.4 Miscellaneous

Name	Part number
Data cable outdoor, 2x2 twisted pair, yard good (for LMS - LMI connection)	6011103
Interface cable (for connecting a laptop/PC)	7040012

8.3 Consumable Parts for 2-Year Operation

Name	Part number	Name
Laserscanner		
Optics cloth	4	4003353
Purge-air unit with fan type 2BH1300		
Filter insert Micro-Topelement C11 100	4	5306091
Purge-air unit in connection box		
Filter insert C1140	4	7047560

8.4 Spare Parts

8.4.1 LMI101 Evaluation Unit

Name	Part number
I960 processor board	7041300
RCP2000 housing Reglo-Card-Plus grey	7042040
LMI front panel with LCD	7044010
LMI motherboard	7044011
EPROM BULKSCAN	2039678

8.4.2 Option Purge-Air Unit in Connection Box

Name	Part number
24 V 60 W power supply unit	7047557
Fan	7047042
Filter insert C1140	7047560

BULKSCAN

Conveyor Belt Monitor

Appendix

9 Appendix

9.1 EC Conformity Declaration

SICK | MAIHAK

EC Declaration of Conformity

Under the terms of EC directives 73/23/EEC and EMV 89/336/EEC

We hereby declare that the devices

of the product family BULKSCAN

are in correspondence with the fundamental requirements, which are listed under point 1 of the EC-Directives. This declaration will loose its validity if any modification to a device is carried out without prior consultation.

During development and production the following EC-Directives and EN standards were considered:

1.	***EC directives***	EC directive NSP 73/23/EEC as per 93/68/EEC, 93/465/EEC EC directive EMV 89/336/EEC as per. 92/31/EEC, 93/68/EEC, 93/465/EEC		
2.	***Harmonised standards and preliminary standards used***	EN 61326	EMC General requirements	Ed. 02-03
		EN 61010-1	Safety regulations for electrical measuring devices, instrumentation and control units and laboratory instruments	Ed. 02-08

The conformity of a type sample of the above-mentioned product family with the regulations of the listed EC directives were certified by:

Ottendorf-Okrilla, 29.4.05

Dr. Volker Herrmann
Managing director

Michael Kochan
Development

The declaration certifies the conformity with the listed directives, but does not guarantee product characteristics.
The safety instructions, contained in the product documentation, must be considered.

This conformity is valid for all the device-variants, which are manufactured according the product definition matrix form of the BULKSCAN.

Fig. 9.1: EC Conformity Declaration, page 1

The EC Declaration of Conformity is valid for the following devices of the product family BULKSCAN:

Device type	Part no.
Laserscanner Indoor LMS200-30106	1029095
Laserscanner Outdoor LMS211-30106	1029096
Laserscanner Outdoor LMS211-30206	1018023
Laserscanner Outdoor LMS221-30106	1029097
Evaluation unit BULKSCAN	7044000

End of list.

Fig. 9.2: EC Conformity Declaration, page 2

9.2 Password

Passwort „Autorisierter Nutzer“

Nach dem Start des menügeführten Parametrierprogrammes MEPA-FW sind nur die Programmfunktionen verfügbar, die keinen Einfluss auf die Gerätefunktion haben.

Nicht eingewiesenes Personal kann keine Änderungen der Parameter vornehmen. Zur Nutzung des erweiterten Funktionsumfanges wird das

Passwort **SICKOPTIC** benötigt.

Falls zur Eingabe eine falsche Taste gedrückt wird, muss das Fenster geschlossen und anschließend die Passworteingabe wiederholt werden.

High level password

After the start of the MEPA-FW parameterization program, the only menus available are those which have no effect on the functioning of the device.
Untrained personnel cannot alter the device parameters. To access the extended range of functions the

High level password **SICKOPTIC** must be entered

If a wrong key is pressed when entering the password, the window must be closed and then the password repeated.

Fig. 9.3: Password

The password is enclosed with the BULKSCAN at delivery as a component of the scope of supply.

9.3 Density and Angle of Repose for some typical Bulk Goods

Bulk material	Bulk density ρ_b [t/m³]	Angle of repose β [°]	
		resting	dynamic
Ash and slag	0,70	50	25
Brown coal	0,70	50	35
Iron haematite	3,20	50	35
Minerals (Cu-Pb)	2,40	40	30
Light minerals	2,04	35	25
Oats, Barley	0,62	35	25
Graphite	2,05	35	25
Caustic lime	1,20	35	15
Dry hydrated lime	0,50	50	15
Potatoes	0,70	25	15
Gravel	1,47	45	30
Coke	0,49	50	30
Pit coal	0,83	45	20
Sorted smalls	0,90	40	20
Clay Loam	1,80	45	25
Flour	0,91	55	35
Marl	2,15	45	30
Mortar	1,70	45	20
Maize, Rye, Rice	0,74	35	15
Sand	1,80	45	20
Sawdust (wood)	0,21	40	20
Wheat	0,79	35	25
Cement	1,47	50	35

BULKSCAN

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