

OPERATING INSTRUCTIONS

LOT369 Bulk Material Level Monitor



Installation
Operation
Maintenance



Document information

Subject

Product name: LOT369
Hardware: all versions
Software: version 1.14 or later

Document ID

Title: Operating Instructions LOT369
Order No.: 8011414
Version: 1.3-[final preversion]
Stand: 2009-03

Manufacturer

MBA Instruments GmbH
Friedrich-List-Str. 5 · 25451 Quickborn · Germany

Trademarks

IBM is a trademark of the International Business Machine Corporation.
MS-DOS and Windows are trademarks of the Microsoft Corporation.
Other product names used in this document may also be trademarks and are only used for identification purpose.

© MBA Instruments GmbH. All rights reserved.

Glossary

Al: Aluminium
ATEX (Atmosphère explosible): European guidelines for the safety in explosion-hazardous locations
PE: polyethylen
PMMA: polymetamethylacrylat
PVC: polyvinylchlorid
VA: stainless steel
VAC: Volt Alternating Current
VDC: Volt Direct Current

Warning symbols



Hazard (general)



Hazard by voltage



Hazard by moving mechanism



Hazard by high temperature or hot surface



Hazard in explosion-hazardous locations

Information symbols



Information for the use in explosion-hazardous locations



Important technical information for this device



Nice to know



Supplementary information



Link to information at another place

Warning levels / signal words

WARNUNG

Indicates a hazardous situation which – if not avoided – could result in serious injury or death.

VORSICHT

Indicates a hazardous situation which – if not avoided – could result in minor or moderate injury.

NOTICE

Indicates a hazard or unsafe practice which could result in property damage.

1	Product description	7
1.1	Intended use	8
1.1.1	Purpose of the instrument	8
1.1.2	Limitations of use	8
1.1.3	Use in explosion-hazardous locations	8
1.1.4	The user's responsibility	9
1.2	Functional principle	10
1.3	Instrument versions	10
1.4	Suitable sensing weight	11
1.4.1	Sensing weight types	11
1.4.2	Custom-made sensing weight	12
1.5	Automatic release of sensing weight when covered	12
2	Installation	13
2.1	Safety notes for installation	14
2.2	Software settings prior to installation (recommended)	14
2.3	Climatic conditions at the place of use	15
2.4	Instrument installation	16
2.4.1	Standard mounting	16
2.4.2	Use of a cable protection tube	16
2.4.3	Special cable guidance (if required)	17
2.5	Electric connections	18
2.5.1	Suitable connecting cables	18
2.5.2	Relay switch outputs	19
2.5.3	Control inputs	20
2.5.4	Measuring value output («current output» option)	21
2.5.5	Power supply	22
2.5.6	Correct sealing of cable glands	23
2.6	Pneumatic connection (option)	24
3	Individual adaptation	25
3.1	Safety notes for operation	26
3.2	Setting the measuring range (0 % / 100 % adjustment)	27
3.3	More individual settings	28
4	Operation	29
4.1	Start-up	30
4.2	Operating elements	30
4.2.1	Display	30
4.2.2	Position bar	30
4.2.3	Keys	31
4.3	Menu functions	32
4.3.1	Menu system (overview)	32
4.3.2	Level indication / highest menu level	33
4.3.3	Menu »Start sounding«	33
4.3.4	Menu branch »Parameter adjustment«	33
4.3.5	Menu branch »Additional functions«	36

5	Maintenance	39
5.1	Replacing the cable	40
5.2	Cleaning the cable box	42
6	Trouble-shooting	43
6.1	Error messages on the display	44
6.2	Possible error messages	44
7	Supplementary equipment	47
7.1	Adjustable stop bead	48
7.2	Protective cover	49
7.3	Internal heating	50
8	Preset pulse counter	51
8.1	Function of the preset pulse counter	52
8.2	Technical data of the preset pulse counter	52
8.3	Installation of the preset pulse counter	52
8.4	Adjusting the preset pulse counter	53
8.5	Level indication at the preset pulse counter	53
9	ATEX certificate	55
10	Technical Data	61

LOT369

1 Product description

Instrument description
Instrument versions
Sensing weights
ATEX certification

1.1 Intended use

1.1.1 Purpose of the instrument

The LOT369 model is designed to be operated on industrial vessels (like silos or tanks), in order to continuously measure the level of the medium in the vessel. It can be used with fine grained or coarse solids and liquids. It can also be used to detect solids in liquids. The MaihakLOT sounding principle is applicable for vessel heights up to 70 m. The smallest measuring span is 0.25 meters.

The possible range of usability depends on the individual model version (→ S. 10, §1.3). To meet the intended application, a suitable type of sensing weight be selected (→ S. 11, §1.4).

Typical mediums are: ore, coal, clinker, stones, aggregate, cement, raw meal, lime, plastic granules, sugar, flour, cereals, sludge, waste water.

A complete measuring system consists of the bin level monitor LOT369 and at least one additional indication or recording instrument (for example, a preset pulse counter).



WARNUNG: Explosion hazard

An LOT369 bin level indicator may only be used in explosion-hazardous locations if the specifications of the unit allow this.

- ▶ Check nameplate and specifications in accompanying papers.



- ▶ In addition to this manual, observe all local regulations, technical rulings and internal-company instructions which are valid at the place of use.
- ▶ Use the instrument only as it is described and specified in this manual. Otherwise the manufacturer's warranty is no longer valid, and the unit could be hazardous in use.

1.1.2 Limitations of use

LOT369 standard versions must not be used in explosion-hazardous locations.

1.1.3 Use in explosion-hazardous locations

The LOT369 version »Z« may be used in dust-explosion-hazardous locations classified as Zone 20, provided that the requirements are fulfilled which are specified in the ATEX certificate (→ S. 55, §9).



In explosion-hazardous locations:

- ▶ Observe the specifications given in the ATEX certificate (→ S. 55, §9).
- ▶ Use only a certified sensing weight type (→ page 11, Tabelle 3).

1.1.4

The user's responsibility**Designated users**

All works and measures described in this document should be made by *skilled persons* who are *trained* and *qualified* to do the following jobs – in skilful quality and with respect to the intended use:

- mechanical installation
- electrical installation
- device configuration and adaptation
- handling and supervision during operation
- maintenance

Moreover, these skilled persons should be familiar with the potential *risks* and *hazards* which might usually occur even if the jobs are skilfully made. They should know and follow all the related *safety precautions*.



A manual is an important part of the instrument. Please store this manual in a safe place after use.

Correct use

- ▶ Use and operate the instrument only as it is described in this manual. The manufacturer is not responsible for consequences of any other use.
- ▶ Make the specified maintenance works.
- ▶ Do not remove, add, or change any of the components in the instrument, unless these changes are described and specified in an official information from the manufacturer. Otherwise
 - the instrument could become dangerous
 - the manufacturer's guarantee becomes invalid
 - the certification for use in explosion-hazardous locations (if applicable) is no longer valid.

Local conditions

- ▶ In addition to these operating instructions, obey all local regulations, technical rulings, and company-internal instructions that are valid at the place of use.

Preserving the documents

- ▶ Keep this document ready for easy access.
- ▶ Hand this document over to any new owner of the instrument.

1.2 Functional principle

The medium level is measured through automated mechanical sounding procedures: a sensing weight is lowered on a cable into the vessel. When the sensing weight reaches the medium surface, the drive motor automatically stops. The unwound cable length is measured and used to immediately indicate the medium level. Then the sensing weight returns to the basic position.

Oscillations and pendulum movements of the sensing weight are suppressed by the sophisticated »soft« motor control.

1.3 Instrument versions

Tabelle 1 Instrument versions (Hardware)

Feature	Standard version	Option(s)
maximum vessel pressure	20 kPa (= 0.2 bar = 2.9 psi)	200 kPa (= 2 bar = 29 psi)
explosion protection	–	certified version for use in dust-explosion hazardous locations classified as Zone 20
measuring range	0 ... 20 m	0 ... 30 / 40 / 50 / 70 m
signal outputs	counter output; resolution: 10 cm	current output (0/4 ... 20 mA), alternatively active or passive; resolution: 10 cm / 1 ... 5 mm (depending on the measuring range)
power supply	230 VAC	42/48/115/ 130/250 VAC
weather protection	–	protective cover for the enclosure
cable protection	–	protective tube from aluminium, length: 0.5 m (optional lengths up to 2 m)
temperature protection	–	thermostatic heating inside the enclosure (on at 10 °C, off at 40 °C)
sensing weight	cylindrical, from PVC	special shapes and materials (→ S. 11, §1.4)
pneumatic connection	–	gas connection inside the enclosure (→ S. 24, §2.6)
additional anti-corrosive protection against aggressive mediums	–	cable box equipped with protective coating and cable pulley made from stainless steel 1.4571

Tabelle 2 Software versions

Feature	Standard version	Option(s)
internal sensing timer	–	»timer« function (→ S. 35)

1.4 Suitable sensing weight

1.4.1 Sensing weight types

Since several types of sensing weight are available (→ page 65, Bild 20), you should use a sensing weight type that meets your application:

Tabelle 3 Sensing weight models

Type	Typical application	Temp. ¹	StEx ²
A plastic weight ³	solids such as e.g. ore, coal, aggregate, granules etc.	≤ 60 °C ≤ 140 °F	yes
B aluminium weight	solids such as e.g. cement, coal, aggregate etc. substances where plastic is not resistant	≤ 150 °C ≤ 300 °F	NO
C StSt weight (stainless steel)	coarse solids where a rugged weight is required, such as ore, coal, aggregate, etc. substances where aluminium and plastic are not resistant		
F perforated weight	light solid mediums where a low immersion depth is important. measurement of sludge in sedimentation basins (liquid/solid detection)	≤ 100 °C ≤ 210 °F	
D spider weight StSt ⁴	light, very loose solids such as flour, plastic powder, coal dust, etc. ⁵ solids causing steep material cones		
O spider weight PE ⁴	– same as type D –	≤ 60 °C ≤ 140 °F	yes
E bag weight	solids and foodstuffs such as rice, cereals, etc. ⁶	≤ 100 °C ≤ 210 °F	

¹ permissible temperature in the vessel

² suitable for use in »StEx« explosion-hazardous locations

³ standard type

⁴ do not use in vessels with pneumatic filling, because the sensing weight could be set into rotation by the filling stream

⁵ note that the immersion depth of the spider weight can vary dependent on the medium

⁶ The delivered bag is filled with plastic granules. Feel free to replace this filling with the original medium – then the medium in the vessel will not be »contaminated« if the bag breaks. Please check that the total weight of the sensing weight is kept to 850 g ±50 g.



- Sensing weight dimensions → page 65, Bild 20
- Sensing weight materials → »Sensing weights« (S. 62)

1.4.2 Custom-made sensing weight

Requirements for a custom-made sensing weight

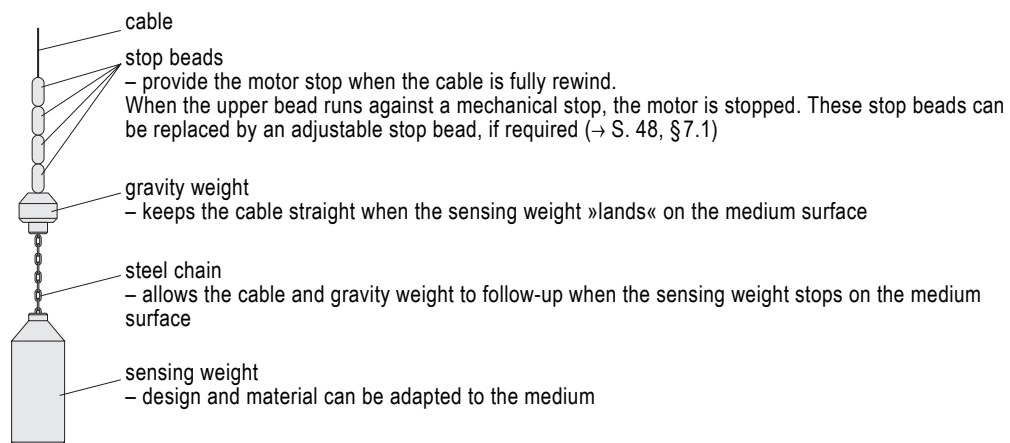
Basically, the design and material of a sensing weight can freely be selected, provided that a safe measuring function is ensured. This means that you could build your own sensing weight, if required. You should meet the following requirements:

- The basic structure of the cable load is kept (→ Bild 1), i.e. the sensing weight is mounted on the steel chain underneath stop beads and gravity weight.
- The weight of the sensing weight is 850 g (± 50 g).

Structure and function of the cable load

Bild 1

Cable load structure



1.5

Automatic release of sensing weight when covered

When the sensing weight is covered by inflowing material or sticks somewhere in the vessel, the LOT369 will start a automatic rescue procedure to release the weight:

The LOT369 tries to pull back the sensing weight twice with full motor power (without torque limitation). Prior to the second trial, the cable winds out for approx. 20 cm (8"). If the sensing weight is free again, it will return to the basic position, and the LOT369 is ready for operation again. If the sensing weight could not be released, the display will indicate **Weight covered** (→ S. 43, §6).



The automatic rescue procedure is only active up from a sounding depth of approx. 1.5 meters.

LOT369

2 Installation

Climatic conditions
Mechanic installation
Power supply
Electronic connections
Pneumatic supply (option)

2.1

Safety notes for installation**WARNUNG: General hazards caused by electrical current**

- ▶ *If the mains voltage is greater than 48 V:* Disconnect the power supply before opening the enclosure.
- ▶ *If the instrument requires live current when being opened during adjustment or repair:* This work may only be made by specialists who are familiar with the potential risks. If internal components are opened or removed, parts may be exposed which contain current.
- ▶ *If any liquid penetrated into the enclosure:* Take the analyzer out of operation and disconnect the power at an external point (for example, pull the power plug). To have the analyzer repaired, report the problem to the manufacturer's service representative or an authorised skilled person.
- ▶ *If the instrument can no longer be used safely:* Take the instrument out of operation. Secure it against an unauthorised start-up.
- ⊗ Do not interrupt Protective Earth connections inside or outside the instrument in any way. Any such interruption may lead to the instrument becoming dangerous.

**WARNUNG: Hazards caused by high temperatures**

- The connecting cables must be protected against high temperatures.
- ▶ Install the cables in such a way that the cables will not get in touch with hot parts (for example, the container wall).
 - ▶ Check if heat emission or heat radiation could affect the cables.
 - ▶ Check for local heat culminations.
 - ▶ Observe the cable specifications (→ S. 18, §2.5.1).

2.2

Software settings prior to installation (recommended)

There are some software settings which must be made to adjust the LOT369 to your individual application. These settings require to operate the instrument when the enclosure is open. It may be easier or necessary to make this in a »safe place« – before the instrument is installed. This would also allow you to check the instrument functions or, for example, change the sensing weight.

If you would like to proceed like this, please do the following:

- 1 Put the LOT369 on a auxiliary rack/frame in such a way that the cable and sensing weight can move freely, and fix the instrument in some way.
- 2 Connect the power supply (→ S. 22, §2.5.5).
- 3 Familiarise yourself with the keyboard functions (→ S. 30, §4.2) and the menu system (→ S. 32, §4.3.1).
- 4 Adjust the measuring range (→ S. 27, §3.2).
- 5 Check which additional individual settings are applicable (→ S. 28, §3.3); make them, if required.

2.3

Climatic conditions at the place of use

- ▶ Make sure that the admissible operational temperature inside the enclosure is kept (-20 ... +60 °C / -4 ... 140 °F).



- The instrument version with protective cover can be used to reduce the effects of direct sun exposure or great temperature fluctuations.
- If required, the protective cover can be installed later (→ S. 49, §7.2).
- Instrument versions with pneumatic connection allow to cool the cable box by feeding-in purging air (→ S. 24, §2.6).

- ▶ *If the LOT369 is installed under the open sky or if the ambient temperature can drop below -10 °C (14 °F):* use the instrument version with internal heating, in order to prevent condensation inside the cable box.



- The internal heating can be installed later, if required (→ S. 50, §7.3).
- Using the protective cover would support the heating.

If the medium temperature is above 80 °C (175 °F):

- ▶ The LOT369 should be mounted on top of a connecting piece, to increase the distance between vessel and instrument. Use an instrument version with cable protection tube (→ S. 16, §2.4.2) for such an installation.
- ▶ Make sure that the sensing weight can stand the medium temperature (→ page 11, Tabelle 3).

**WARNUNG: Explosion risk**

If the LOT369, version »Z«, is used in an explosion-hazardous location:

- ▶ Observe the specifications given in the ATEX certificate (→ S. 55, §9).
- ▶ Observe all corresponding information in this manual.
- ▶ Observe all regulations, technical standards, and rules which apply at the place of use (for example, European standard EN 60079-14).
- ▶ Have the installation works made by specially trained and authorised personnel.

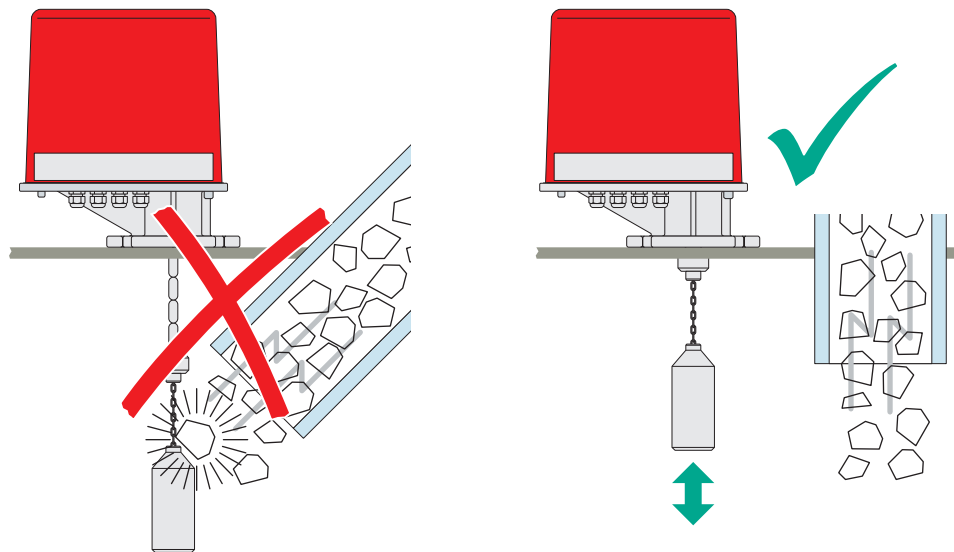
2.4 Instrument installation

2.4.1 Standard mounting

- The LOT369 flange is suitable for standard flanges from DN 80 PN 10 to DN 100 PN 10. Four screws (Ø 16 mm) are required for mounting.
- The flange must be horizontal so that the cable and stop beads can freely run into the channel of the enclosure (notes on different mounting positions → S. 17, §2.4.3).
- Choose an installation place where inflowing medium will not cover or damage the sensing weight (→ Bild 2).

Bild 2

Suitable installation place



- ▶ Make sure that the cable cannot be damaged by edges – neither inside the vessel nor at the flange.
- ▶ *If this risk cannot be avoided:* use an instrument version with cable protection tube (→ §2.4.2).

2.4.2 Use of a cable protection tube

You should use an instrument version with a cable protection tube in the following situations:

- if the cable could be scratched or damaged inside the vessel (for example, at thick vessel walls or sharp edges)
- if the cable could be damaged by inflowing medium
- if strong pendulum movements of the sensing weight can be expected

The standard length of the protective tube is 500 mm. The maximum length (special versions) is 2000 mm.



The basic position of the sensing weight shifts downwards by the length of the cable protection tube (dimensions → page 64, Bild 19).

2.4.3

Special cable guidance (if required)

If required, the cable can be guided around pulleys. This allows to adapt the LOT369 to »difficult« locations – for example, if the vessel is open on top, when there is not enough room for the standard mounting position, or if the medium is very hot.

You would need:

- Suitable guidance pulleys for the cable (easy-running and smooth)
- A special mechanical stop for the sensing weight. This is at least a mechanical stop for the stop beads, mounted in front of the last pulley. It may be required to use an adjustable stop bead (→ S. 48, §7.1).
- Electrical installations are not required.

When the cable is guided to the vessel via pulleys, a horizontal flange mounting position is no longer required. In such cases the LOT369 can also be mounted on an angled or vertical flange – for example, at the side of the vessel. Allowable inclination from the horizontal flange position is 0° ... 90°.

To wind out some cable length prior to installation:

- Connect the LOT369 to the power supply an(→ S. 22, §2.5.5).
- Use the **Manual operation** function to wind the cable out, as far as required (→ S. 37).

2.5 Electric connections

Bild 3 Wiring terminals

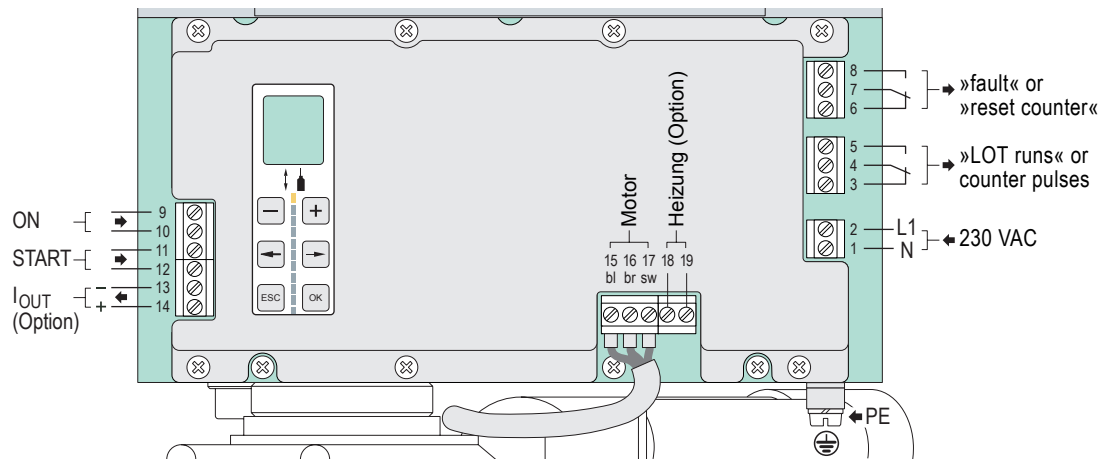
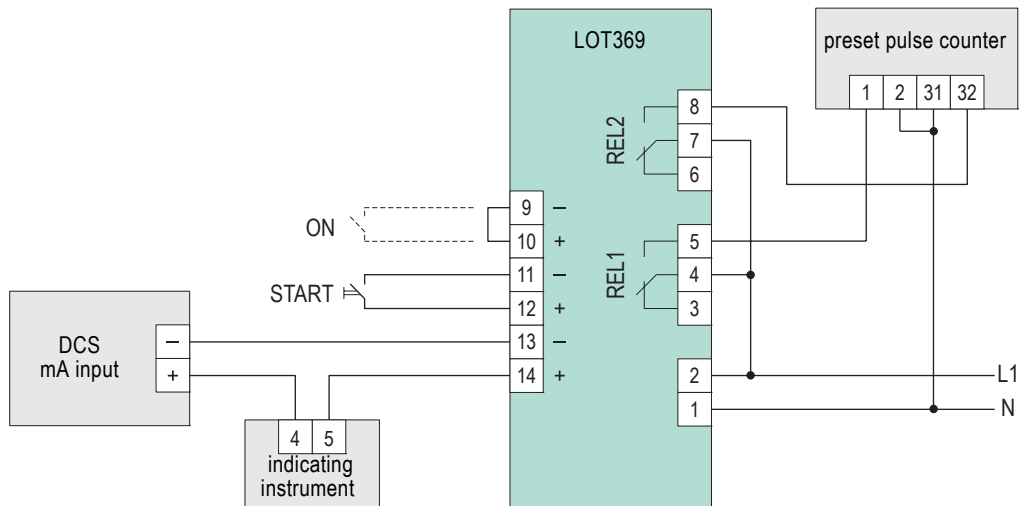


Bild 4 Exemplary wiring



In Bild 3 and Bild 4, the power-off condition is shown.

2.5.1 Suitable connecting cables

► Use only connecting cables which meet the following specifications:

Conductor cross-section	- massive wire:	≤ 2,5 mm ²
	- stranded wire:	≤ 1,5 mm ²
Outer diameter:		6 ... 12 mm
Permissible ambient temperature:		≥ 60 °C (140 °F)

► Use only cables which fit to the cable glands.

2.5.2 **Relay switch outputs**

Associated switching functions

Depending on the instrument version, some of the switch output functions are variable (→ Tabelle 4 and Tabelle 5):

Tabelle 4 Relay switch output functions for instruments without the »current output« option

REL1	counter pulses
REL2	»counter reset« or »fault« (function selection → S. 34)

Tabelle 5 Relay switch output functions for instruments with the »current output« option

	Relay counter output on ¹	Relay counter output off ¹
REL1	counter pulses	»LOT runs«
REL2	»counter reset« or »fault« ²	»fault«

¹ function selection → S. 34

² function selection → S. 34

Switch function »counter pulses«

When the cable winds out, this switch contact is activated once for each height unit (one 100 ms pulse for every 0.1 m). Thus a connected electronic counter device (for example, a preset pulse counter → S. 51, §8) can indicate the medium level by counting the pulses. – Please note: the counting runs in »reverse« direction, i.e. counts down from the maximum level (»100 %«) to the current level.

Switch function »reset counter«

This switch contact is shortly activated when a sensing is starting (200 ms pulse). This is used to set the connected counting device (→ »Switch function »counter pulses«) back to the initial value (preset maximum level) when the sounding procedure starts.

When an fault occurs, the reset pulse is automatically triggered to make the external counter indicate 100 % (= »vessel is full«, in order to produce a fail-safe condition.



Some electronic counters may not need a reset pulse – for example, a DCS device which automatically resets the counter when no counter pulses are triggered for a certain period (i.e. in the pause between the sensings). In such cases, you could to use the REL2 contact for the fault message.

Switch function »fault«

In trouble-free condition, this switch contact is activated (relay powered on); when a fault occurs, the switch contact is deactivated (relay powered down). In addition to internal troubles (→ S. 43, §6), the following fault conditions are indicated:

- power supply voltage off
- no level measurement (yet) performed after last power-on

Switch function »LOT runs« (only available with »current output« option)

This switch function is activated as long as the sensing weight is not in the basic position – i.e. when the LOT369 performs a sounding procedure. You may want to use this function to make sure that the vessel will not be filled when sounding procedures are running, to prevent that the sensing weight is covered or a wrong level is measured.



In addition, or alternatively, you can use the control input »ON« to prevent that sounding procedures are started when the vessel is just being filled or emptied (→ »Control input »ON««).

Permissible load of the switch contacts

Minimum load of the relay switch contacts		10 mV, 10 µA
Maximum load for the relay switch contacts	function »LOT runs«, »fault«	AC: 250 VAC, 5 A, 750 VA DC: 250 VDC, 1 A, 54 W
	function »counter output« (REL1)	250 VAC, 0.2 A
	function »reset counter« (REL2)	250 VAC, 3 A, 500 VA
function »counter output«	pulse frequency:	2.8 Hz
	switch-on pulse width:	100 ms
function »counter reset«	switch-on pulse width:	200 ms

2.5.3

Control inputs

Electronic load

The control outputs are operated at 20 VDC. Maximum current is 5 mA.

Control input »START«

Use this control input to start single sounding procedures from an external location. For that, connect the control input to an external switch contact – for example, a pushbutton, a DCS device, a timer. When the external switch is closed, a sounding procedure starts.

To start the sounding in the **Floa**t mode (= continuous sounding, → S. 35), the control input »ON« must be used (see below).

Control input »ON«

Sounding operation requires that the control input »ON« is closed. When the control input »ON« is open (no connection between both terminals), then no sounding procedure will start.

If the control input is opened when a sounding procedure is running, then this sounding procedure is aborted, and the sensing weight immediately returns to the basic position. When sounding mode **Hover** is selected (= sounding starts from a »hovering« position above the medium surface, → S. 35), opening this control input effects that the »Hover« mode is stopped and the sensing weight returns to the basic position.

When sounding mode **Floa**t (→ S. 35) is selected, the control input »ON« is used to start and stop the »floating« sounding operation (= continuous sounding).

You should use the control input »ON« to prevent that sounding procedures are running when the vessel is just being filled or emptied. Otherwise the lowered sensing weight could be damaged or covered by the medium.



If the control input »ON« is not used:

- ▶ Install a short-circuiting wire bridge on its terminals. Otherwise sounding procedures will not be started.

2.5.4

Measuring value output (»current output« option)

Instruments with »current output« option produce an analog output signal (via wiring terminals Iout, → page 18, Bild 3) which represents the last measured medium level.

Output modes

There are two different output modes available:

- »Active«: the current output works as a variable current source, i.e. it drives an intrinsic current. Signal range is 0 ... 20 mA or 4 ... 20 mA alternatively (→ S. 33, §4.3.4). Admissible load is 0 ... 500 Ω.
- »Passive«: the current output reacts like a variable current sink. In this mode, a constant external signal voltage is fed-in and the LOT369 will control the signal current. Admissible voltage range is 8 ... 36 VDC. Current signal range is 0 ... 20 mA or 4 ... 20 mA alternatively (→ S. 33, §4.3.4).

For selecting the output mode see S. 33, §4.3.4.

Reference level

The electronic signal range can be inverted (→ S. 33, §4.3.4). This allows to select whether the current output signal is referred either to the minimum medium level (»0 %«) or to the maximum medium level (»100 %«).

Current signal during fault condition

You can select whether the current output indicates 22 mA or 0 mA when the instrument is in »fault« condition (→ S. 33, §4.3.4).

2.5.5

Power supply**WARNUNG: Hazards by mains power**

- ▶ Observe the general safety notes (→ S. 14, §2.1).

**VORSICHT: Automatic movement after power-on**

As soon as the LOT369 is supplied with mains power, a short automatic initialisation procedure runs down (display reading: `LOT Init`) where the sensing weight will once move to a reference level approx. 25 cm (10") below the basic position and back to the basic position.

- ▶ *Before switching-on the mains power supply:* Make sure that the mechanical procedure can run down safely. Keep hands and objects away from the hole where the cable moves in.

Power supply system

- ▶ Install an external power switch which can switch on and off the mains power supply to the LOT369. Install this switch near the LOT369. Indicate this switch clearly and unmistakably.
- ▶ Provide an external mains fuse for the LOT369 (fuse rating → Tabelle 6).

Tabelle 6

External mains fuse rating

Mains voltage:	42 V	48 V	115 V	130 V	230 V	250 V
Mains fuse:	6.3 A MT	5.0 A MT	2.0 A MT		1.0 A MT	

Suitable cables

- ▶ Use only suitable connecting cables (specifications → S. 18, §2.5.1).

Protective earth

- ▶ Connect the protective earth line (PE) to the terminal located on the edge of the electronics board (→ page 18, Bild 3).

**NOTICE:**

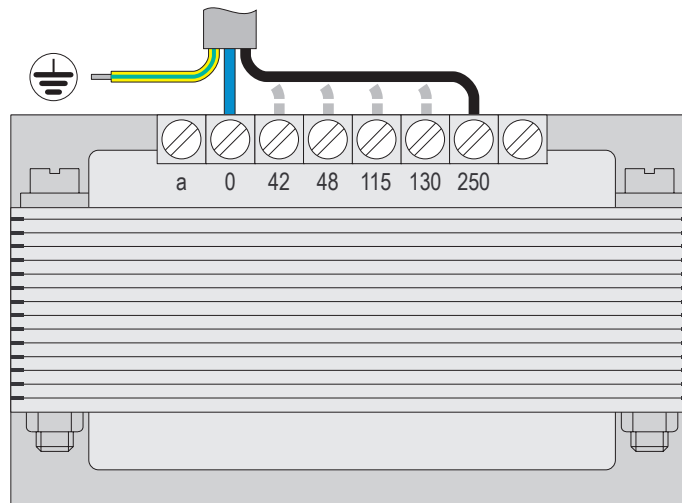
In explosion-hazardous locations:

- ▶ In addition to the protective earth connection (PE), install an equipotential bonding connection, using the terminal on the outside of the unit.

Terminals

- ▶ *For the instrument version for 230 VAC mains voltage (standard version):* Connect the power supply lines to wiring terminals 1 and 2 of the electronics board (→ page 18, Bild 3).
- ▶ *For the instrument version for other mains voltage (42/48/115/130/250 VAC, optional):* Connect the power lines to the corresponding terminals of the transformer which is mounted in the chassis (→ Bild 5).

Bild 5 Power supply terminals of the mains voltage transformer (option)



2.5.6 **Correct sealing of cable glands**



WARNUNG: Explosion risk

In explosion-hazardous locations:

- ▶ Seal the cable glands before starting up the instrument.
- ▶ Also seal all of the unused cable glands, either with a sealing plug or by replacing the cable gland with a closing cap. Closing caps must be specified for use in explosion-hazardous locations.

2.6

Pneumatic connection (option)

Function

If the LOT369 is equipped with a pneumatic connection, purging air can be fed into the cable box. The air will escape through the LOT369 cable channel into the vessel. In this way you can prevent dust from intruding into the cable box (for example, with a medium which produces a lot of fine dust).

Moreover, the pneumatic connection can be used if the vessel is hot, in order to cool down the cable box (and therefore the entire LOT369 enclosure) with a constant stream of fresh air.

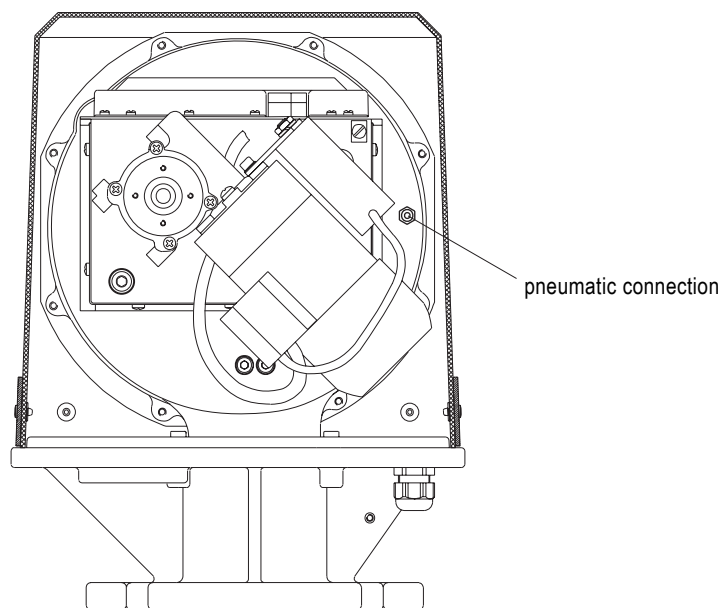
The pneumatic connection should only be used on unpressurized vessels.

Connection

- 1 Use an air hose with an outer diameter that fits to the LOT369 cable glands.
- 2 Guide the air hose through a cable gland and connect it to the pneumatic connection an (1/4" fitting, → Bild 6).
- 3 Adjust a suitable input pressure:
 - for minimum protection characteristic, +0.1 bar (1.5 psi) is sufficient.
 - standard value: +0.2 bar against the pressure in the vessel.

Bild 6

Pneumatic connection



pneumatic connection

LOT369

3 Individual adaptation

Measuring range
Individual setup

3.1

Safety notes for operation**WARNUNG: Hazards inside the open instrument**

The operating panel is inside the instrument. Operation requires to run the LOT369 in operating condition, with the instrument cover removed.



- Electrical circuits inside the instrument are not protected against physical contact. In operating condition, there are electrical contacts conducting mains power voltage.
- The drive motor can be hot (135 °C/275 °F).
- ▶ Allow only specialists who are familiar with the potential risks to make works inside the instrument in operating condition.

**WARNUNG: Electrical hazard caused by liquids**

If any liquid has penetrated into electrical components:

- ▶ Take the analyzer out of operation and disconnect the power at an external point (for example, pull the power plug).
- ▶ Take the instrument out of operation. Secure it against an unauthorised start-up.
- ▶ To have the analyzer repaired, report the problem to the manufacturer's service representative or an authorised skilled person.

Setting the measuring range (0 % / 100 % adjustment)



► Make these essential settings to adapt the LOT369 to your vessel.

Function

The »Adjustment« functions are used to adapt your LOT369 to the minimum and maximum filling heights of your vessel. You will set-up which sounding depth is »0 %« or »100 %« of the measuring range. »0 %« corresponds to a minimum filling level, »100 %« to a maximum filling level. The minimum distance between »0%« and »100%« level is 0.25 m.

Setting procedure

- 1 Press **OK**: the display shows `Start sounding?`.
- 2 Press **+** or **-**, until `Parameter adjustment` is displayed.
- 3 Press **OK**: the display shows `Adjustment`.
- 4 Press **OK** again: the display shows `Adjustment in ...`.
- 5 Press **+** or **-** to select the desired length unit (`m(d)` or `ft`).
- 6 Press **OK**. (**ESC** can be used to abort without changing the values).
- 7 Press **+** or **-** until `0% at m (d) ...` is displayed.
- 8 Enter the cable wind-out length which is required to reach the minimum medium level (e.g. `38.4 m`).



When the vessel is empty, the sensing weight will not stop lowering exactly at the »0 %« level, but will run a little over this limit (approx. 1 % of the measuring range). Therefore:

► Set-up the »0 %« value in such a way that the sensing weight will always have a sufficient distance to vessel discharge facilities.

- 9 Press **OK** to confirm the value.
- 10 Press **+** or **-** until `100% at m (d) ...` is displayed.
- 11 Enter the cable wind-out length required to reach the maximum level (e.g. `1.4 m`).
- 12 Press **OK** to confirm the value.
- 13 To return to the `Distance` display, press **ESC** several times.

Test

- 1 Press **OK**: the display shows `Start sounding?`.
- 2 To start a sounding procedure manually, press **OK** again: the display shows `Stop with ESC`, and a sounding procedure runs down. Observe if the procedure works correctly.

3.3

More individual settings

For a complete adaptation, you may want to use the following settings:

For the sounding procedure:

- Sounding mode (standard, float, hover) 35
- Failure mode (indication when measuring range is exceeded) 36
- Reverse power (adaptation to the medium) 37
- Timer (periodical automatic starts of sounding procedures [option]) 35

For the current output (Option):

- Electronic mode (active source or passive sink) 34
- Signal range (0 ... 20 mA or 4 ... 20 mA) 34
- Reference level (20 mA = »100 %« or »0 %«) 34
- Fault indication (0 or 22 mA) 34

For the menu operation:

- Menu language 36

LOT369

4 Operation

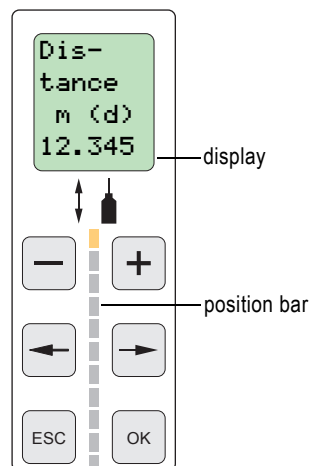
Start-up
Keypad
Menu system
Functions

4.1 Start-up

- 1 Close the enclosure (otherwise, the specified protection is not guaranteed).
- 2 Switch-on the external power supply.
 - As soon as the LOT369 is supplied with mains power, a short automatic initialisation procedure runs down (display reading: `LOT Init`) where the sensing weight will once move to a reference level approx. 25 cm (10") below the basic position.
 - After that, the LOT369 is ready to use.

4.2 Operating elements

Bild 7 Display and keyboard



4.2.1 Display

- During normal operation, the last measured medium level is displayed. The value is referred to the lower edge of the sensing weight.
- During menu operation, menu functions and messages are displayed (→ S. 32, §4.3). ▼ or ▼ symbols indicate that the next menu step can be entered by pressing .

4.2.2 Position bar

The LED bar indicates the current position of the sensing weight, in order to let you know where the sensing weight just is. The top segment indicates the basic position (= sensing weight on highest position).







4.2.3

Keys

Use the 6 keyboard keys to navigate through the menu system and to make the settings:

Tabelle 7

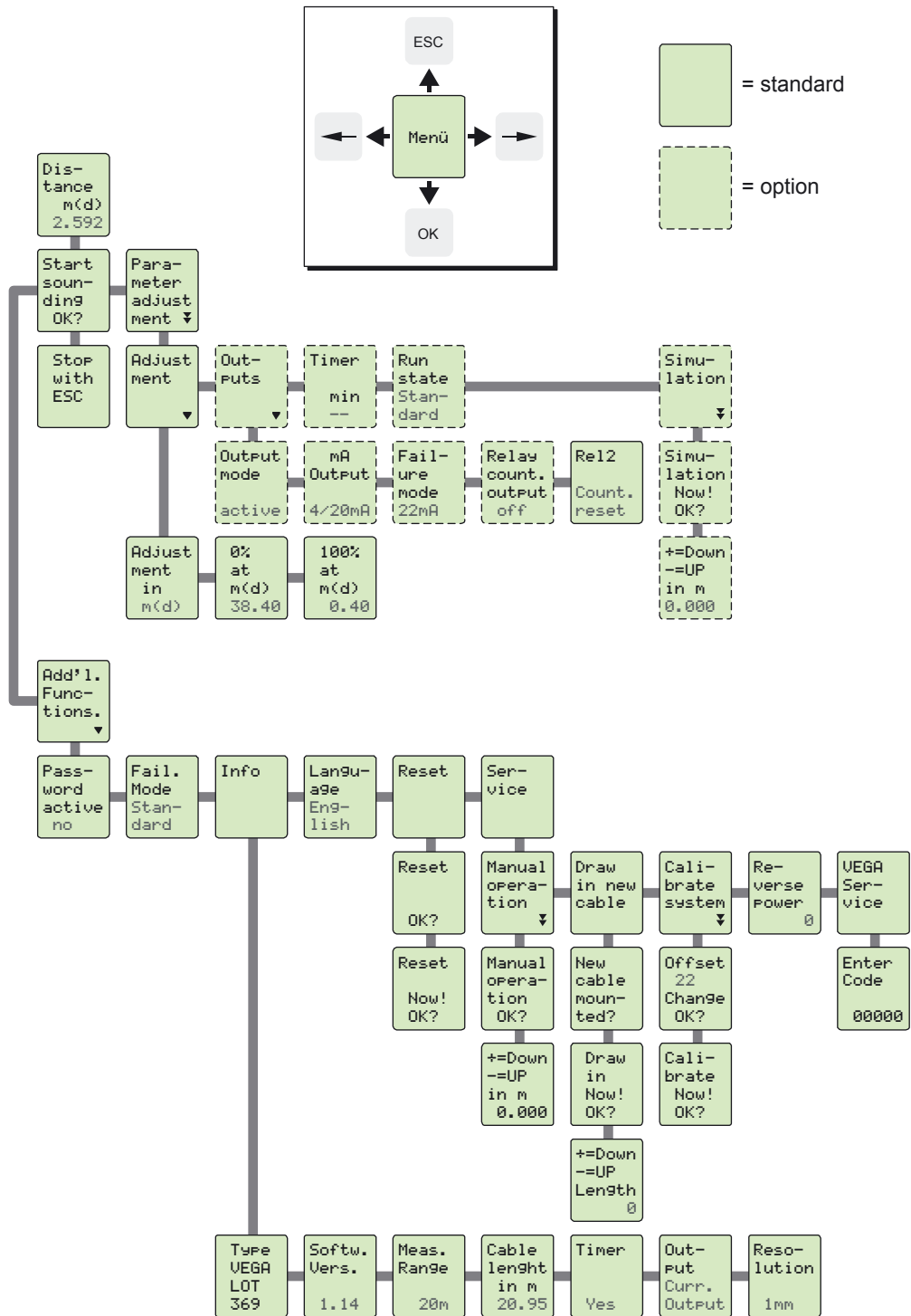
Key functions

Key	Function (depending on the displayed menu)
	<ul style="list-style-type: none"> - Confirm input. - If ▼ is shown in the display: move to the following menu level. - If ▼ is shown in the display: move to the next step of the procedure.
	<ul style="list-style-type: none"> - Cancel the input procedure or stop a running function. - Move to the previous menu level.
 	<ul style="list-style-type: none"> - Change the setting value. - Select the desired function. <p>After pressing for the first time, the displayed setting flashes. Then each pressing will change the value or setting. In case of numeric inputs, you can keep these keys depressed to let the value change rapidly.</p>
 	<ul style="list-style-type: none"> - Move through the menus of the same menu level.

4.3 Menu functions

4.3.1 Menu system (overview)

Bild 8 Menu system



4.3.2 Level indication / highest menu level

The highest menu level is the `Distance m (d)` display which constantly shows the medium level that was measured with the last sounding procedure. The `Float` mode (→ S. 35) works with a continuous indication of the current medium level.



The display will automatically switch back to the `Distance m (d)` menu when no key has been pressed for 5 minutes. This does not happen when using the functions `Simulation`, `Manual operation`, and `Draw in new cable`.

4.3.3 Menu »Start sounding«

To start a single sounding procedure via the keyboard:

1 Call-up the `Start sounding?` menu.

2 Press `OK`.

→ The sounding procedure proceeds.

To abort the sounding procedure:

▶ Press `ESC`.

→ The sensing weight returns to the basic position.



When the `Float` mode is used (→ S. 35), `Start sounding?` is disabled.

4.3.4 Menu branch »Parameter adjustment«

Adjustment

- `Adjustment in ...` allows you to select the length unit for the measuring value:
 - `m (d)` = meters (default setting) (d = distance)
 - `ft (d)` = feet
- `0% at m (d) ...`: This setting fixes the lower end of the mechanical measuring range. Normally, this is the desired minimum medium level in the vessel or the »completely empty« status. Set-up the cable length that must wind out to reach this position (calculated from the basic position of the sensing weight). If the LOT369 has already been installed on the vessel, you can find out the proper value by manually lowering the sensing weight into the vessel, using the `Manual operation` menu (→ S. 37, »Service«).
- `100% at m (d) ...`: This setting fixes the top end of the mechanical measuring range. The setting works in the same way as for `0% at ...`, however for the desired maximum medium level in the vessel or the »completely full« status.



When the vessel is empty, the sensing weight will not stop lowering exactly at the »0 %« level, but will run a little over this limit (approx. 1 % of the measuring range). Therefore:

- ▶ Set-up the »0 %« value in such a way that the sensing weight will always have a sufficient distance to vessel discharge facilities.



The minimum distance between »0%« and »100%« level is 0.25 m.

Outputs (only with »current output« option)

Use these functions to select the operation modes of the current output.

- **Output mode:** select the electronic mode of the current output:
 - **active** (default): the current output works as a variable current source, i.e. it drives an intrinsic current (for example, for an external analog meter).
 - **Passive:** the current output reacts like a variable current sink. In this mode, a constant external signal voltage must be fed-in (8 ... 36 VDC; for example, from a DCS device with »active« mA input), and the current is internally controlled according to the medium level.
- **mA Output:** select which the electronic signal range is used to represent the measuring range (0 ... 100 %):

Setting	Signal at »0 %«	Signal at »100 %«
0...20mA	0 mA	20 mA
4...20mA	4 mA	20 mA
20...0mA	20 mA	0 mA
20...4mA	20 mA	4 mA



This setting also allows you to choose whether the current output is referred to the »filling process« of the vessel (20 mA = 100 % filled) or to the »emptying process« (20 mA = 0 % filled).

- **Failure mode:** select the electronic signal that the current output indicates during instrument fault conditions: 22 mA (= default) or 0 mA.
- **Relay counter output:** activate/deactivates the counter output. The counter produces one switch contact pulse for each length unit (10 cm steps):
 - **on**= counter output is activated
 - **off**= counter output is not activated (default setting)

	counter output on ^{1 2}	counter output off
REL1	counter output (counter pulses)	»LOT runs«
REL2	»counter reset« or »fault« ³	»fault«

¹ = function for instruments without »current output« option

² **Caution:** after a **Reset** (→ S. 36) the counter output is set to **off**.

³ alternative selection: see below

- **Relay 2:** makes a separate mode selection for REL2 (even with activated counter output). Possible settings are:
 - **Counter reset**= reset pulse for a connected preset pulse counter
 - **Failure**= fault indication

The **Failure** setting can be used if the counter pulses are fed into a device which automatically resets its counter when no more counter pulses are generated for a certain time (i.e. between the sounding procedures). DCS devices may work like this. In such cases, you can use REL2 for failure indication.

Timer (option)

Using the timer function, you can set-up automatic starts for sounding procedures:

- Set-up how long the pause should be between the sounding procedures (1 to 9999 minutes). The first pause interval starts when you switch back to the **Distance** display. When »--« is selected, automatic starts are disabled.
- Sounding procedures will only start if the control input »ON« is closed (→ S. 20, §2.5.3). If this control input open at the time of an automatic start, then the sounding procedure is skipped and a new pause interval begins.



Please consider the cable life. If you set-up the pauses to be only 1 minute, then the expected life of the cable is approximately 3 months.



The **Timer** setting determines the pause *between* the sounding procedures, but not the exact time interval of soundings. If you want to have soundings at definite times, you should connect the control input »START« to an external timer control device (→ S. 20, §2.5.3).

Run state (only with »current output« option)

selects the sounding mode:

- **Standard**: The sensing weight is lowered from the basic position to the medium surface and then returns to the basic position.
- **Hover**: The sensing weight is lowered from the basic position to the medium surface and then goes back to a parking position which is approximately 1 meter above the medium surface. The next sounding procedure will start from this »hovering« position. With this method, sounding procedures are quicker. – This mode is mainly suitable for liquids.

To start the »Hover« mode, the control input »START« must be used (→ S. 20, §2.5.3). Control input »ON« must be closed. To terminate the »Hover« mode (i.e. to rewind the sensing weight to the basic position), control input »ON« must be opened.



If the LOT369 is used on a vessel with solid medium:



- ▶ Use the **Hover** mode only to monitor *sinking* medium levels. Do not use it to monitor *rising* medium level – because in this case the sensing weight could be covered in its »hovering« parking position.
- ▶ Always terminate the »Hover« mode (= open the control input »ON«) before the vessel is going to be refilled.

- **Float**: This mode must only be used in liquids and requires a float weight. To start the »Float« mode, the control input »ON« must be closed (→ S. 20, §2.5.3). When the float mode is started, the float weight is lowered from the basic position to the medium surface and then continuously follows the surface. The current medium level is continuously indicated. To terminate the »Float« mode, control input »ON« must be opened. – In the »Float« mode, the **Start sounding?** function not operative.



- ▶ Always terminate the **Float** mode before the mains power supply is switched off, in order to rewind the sensing weight to the basic position. Otherwise, after the next power-on, correct cable winding could fail if the vessel has been filled in the meantime.

Simulation (only with »current output« option)

This function allows an electronic simulation of different medium levels. Use the  and  key so select which level should be indicated by the LOT369 (within the measuring range, in m or ft).

4.3.5

Menu branch »Additional functions«**Password active**

- **no** = password protection disabled (default)
- **yes** = password protection enabled

When the password protection is enabled, the internal settings cannot be changed – prior to each setting menu, **Password?** is displayed. To deactivate the password protection, enter the number **369** in the **Password?** display and press **OK**.

Failure mode

Select if the LOT369 activates the fault indication when the medium level exceeds the measuring range:

Setting	Fault indication
Standard	no fault indication referred to the measuring range
< -1 %	when the last measured medium level is below –1 % of the measuring range
> +101 %	when the last measured medium level is greater than 101 % of the measuring range ¹
<-1 % >+101 %	when the last measured medium level is either below –1 % or greater than +101 % ¹ of the measuring range

¹ only working in instruments with »current output« option

Info

These menu functions display internal information on your instrument:

- **Type**: instrument model identification (**MaihakLOT 369**).
- **Software Version**: version of the internal software.
- **Meas. Range**: measuring range available on the display (e.g. **60 m**).
- **cable length**: cable length wound-up on the cable pulley (e.g. **61,74 m**).
- **Timer**: indicates whether the »Timer« option is available (e.g. **yes**).
- **Output**: indicates whether the »current output« option is available (e.g. **4/20mA**).
- **Resolution**: resolution of the level measurement (with counter output: **10 cm**; with current output: **10 cm** or **1 mm**)

Language

Use this function to select the desired menu language. – Note: A **Reset** (see below) will not change the language.

Reset

With this function you can reset all of the LOT369 settings to the default settings.



- The effect of a **Reset** cannot be undone; you will have to re-do all the individual settings (except for **Language**).
- In instruments with »current output« option, the counter output (→ S. 34) is deactivated after a reset.

Service

- **Manual operation:** this menu allows you to manually wind the cable in and out. **+** starts/stops winding out, **-** starts/stops winding in.



WARNING: Risk of mechanical trouble

When the sensing weight reaches the medium surface, it will not automatically be stopped. If the cable winds out more after the sensing weight has »touched down«, then the cable will no longer be strained, due to the missing weight.

► *If the cable is not strained:* carefully strain the cable by hand when winding up again, so that the cable correctly rewinds.

Otherwise the cable pulley could be jammed.

- **Draw in new cable:** this function is used when replacing the cable (→ S. 40, §5.1).
- **Calibrate system:** this function starts an automatic procedure which will check and calibrate the internal measuring apparatus. This must be done when components of the mechanical drive and/or internal measuring components have been dismantled or replaced. The procedure requires to remove the LOT369 from its installation place.
 - 1 Fix the LOT369 on a auxiliary rack above a horizontal surface (for example, above the ground floor). The distance between the lower edge of the sensing weight (in basic position) and the ground surface must not exceed 2 m. – Note: The programmed »Ø%« value (→ S. 33, »Adjustment«) may not be smaller than this distance.
 - 2 Select the menu function **Calibrate system**.
 - 3 **Offset XX ändern OK?** is displayed. Press **OK** to continue.
 - 4 **Calibrate Now! OK?** is displayed. Press **OK** to start the automatic procedure. The sensing weight will once be lowered to the ground surface.
 - 5 Wait until the automatic procedure is finished.
- **Reverse Power:** this function allows to adjust the sensitivity used for detecting the medium surface. For floating weights in liquids, the setting determines the immersion depth of the weight. For the »Float« sounding mode (→ S. 35), the setting determines the floating sensitivity. – Default setting: 0.
 - Smaller values (-1 ... -10) will effect a more sensitive sounding (for example, for a very light medium).
 - With greater values (+1 ... +10) the sounding will be less sensitive. This can be used, for example, to prevent wrong measurements when some frictional force interferes with the cable.
- **VEGA-Service:** via this function, software options can be enabled. This requires special activation codes which are individual for each instrument and each option.

LOT369

5 Maintenance

Cleaning
Cable replacement

5.1

Replacing the cable

**VORSICHT: Risk of injuries**

Inside the cable box, motor-driven movements are executed. The cable and rotating parts could cause injuries when fingers or hands are wedged in.

- ▶ Make any works inside the cable box only when the mains power is switched off from the LOT369.



If the LOT369 is equipped with the »protective coating« option: the inside of the cable box is coated with a special varnish.

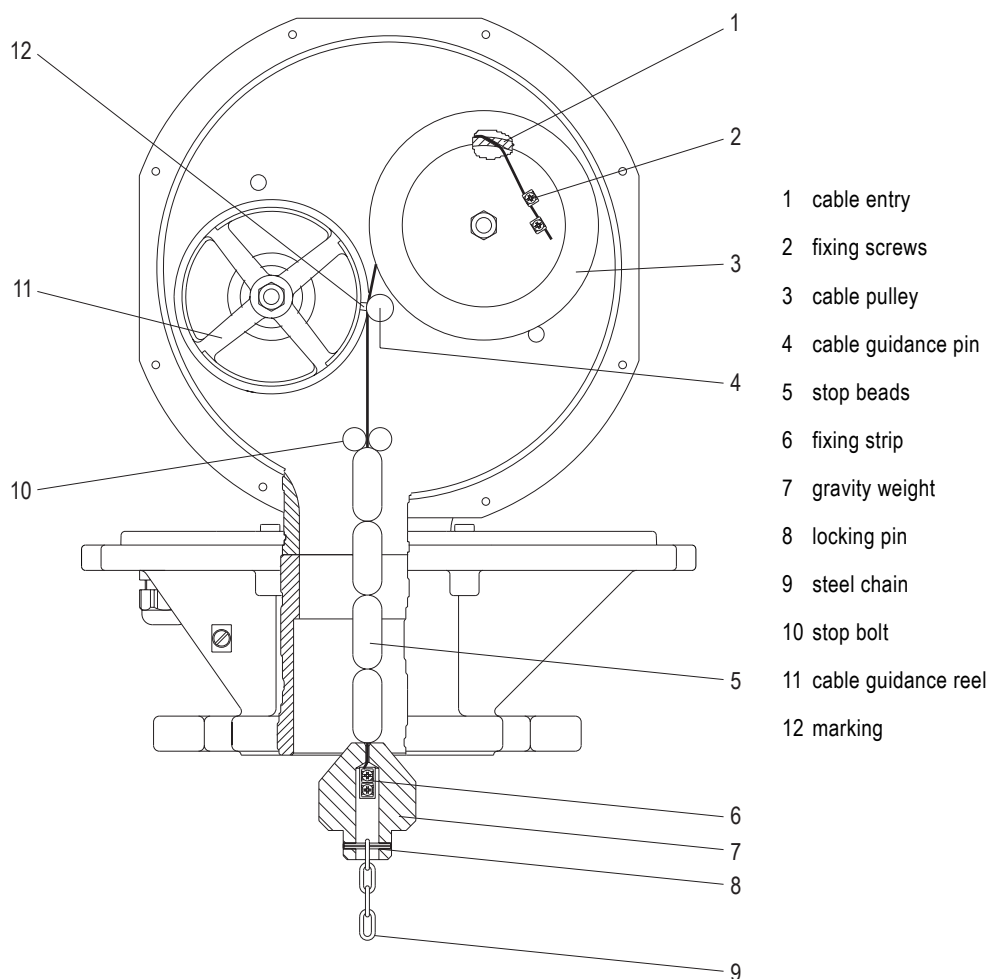
- ▶ Take care to keep the coating of the cable box intact.



Recommendation: make this procedure with two persons – one person holding the new cable, the other person operating the keyboard.

Bild 9

Cable pulley



- 1 Shut-down the LOT369 (switch off mains power).
- 2 Remove the instrument cover:
 - a) Loosen the locking screws.
 - b) Open the quick-snap lockings.
 - c) Lift-off the cover.
- 3 Remove the cable box cover (8 screws).

- 4 Loosen the two fixing screws (2) to release the old cable.
- 5 Completely remove the old cable from the cable pulley (3) to the front.
- 6 Use a 3 mm drift punch to eject the locking pin (8) out of the gravity weight (7).
- 7 Loosen the two screws of the fixing strip (6) with a screwdriver and remove the old cable.
- 8 Remove all parts from the old cable. If an adjustable stop bead is installed (→ S. 48, §7.1): remove also the adjustable stop bead.
- 9 Start-up the LOT369 (switch-on mains power).
- 10 Press **OK**: the display shows `Start sounding?`.
- 11 Press **+** or **-** until `Add1 1. Functions` is displayed.
- 12 Press **OK**: the display shows `Password`.
- 13 Press **←** or **→** until `Service` is displayed.
- 14 Press **OK**: the display shows `Manual operation`.
- 15 Press **OK**: the display shows `Manual operation OK?`.
- 16 Press **OK**: the display shows `+UP -Down in m.`
- 17 By pressing **+** or **-**, turn the cable guidance reel (11) up to the marking (12) on the cable guidance pin (4) (→ Bild 9).
- 18 Loop the new cable through the groove of the cable guidance reel (11).
- 19 Insert the new cable into the cable entry (1) of the cable pulley (3).
- 20 Fasten the cable end with the two fixing screws (2) in the cable pulley (3).
- 21 Press **ESC**.
- 22 Press **←** or **→** until `Draw in new cable` is displayed.
- 23 Press **OK**: the display shows `New cable mounted?`
- 24 Press **OK**: the display shows `Draw in Now! OK?`
- 25 Press **OK**: the display shows `+Down -UP Length.`
- 26 Press **-** to draw-in the cable. When there are approx. 2 meters left to be drawn-in, press **-** again to stop the cable drive.



- ▶ Make sure that the cable is strained during winding.
- ▶ Draw in the cable continuously and avoid jerkily cable movements. Otherwise the cable could be jammed.

- 27 *If an adjustable stop bead is provided:* Install the adjustable stop bead in the cable (→ S. 48, §7.1).
- 28 Shift the four stop beads (5) to the new cable.
- 29 Shift the gravity weight (7) to the new cable.
- 30 Plug the fixing strip (6) to the cable end and tighten the two screws with a screwdriver. Note that the cable protrudes at least 1 cm out of the fixing strip.
- 31 Guide the end of the steel chain (9) into the gravity weight (7). Connect the parts by inserting locking pin (8) through the hole of the gravity weight (7) and the upper chain link. The locking pin should fit flush.
- 32 Press **-** to completely draw-in the cable.
- 33 Press **ESC** several times until `Distance ...` is displayed.



When you quit the menu `Draw in new cable`, the rewound cable length is automatically stored.

- 34 Re-attach the cable box cover and the instrument cover.

5.2

Cleaning the cable box

We recommend to check the LOT369 cable box every 6 months on dust and clean if necessary.



If the LOT369 is equipped with the »protective coating« option: the inside of the cable box is coated with a special varnish.

► Take care to keep the coating of the cable box intact.



The bearings are sealed. The mechanical parts are maintenance-free and do not need to be greased.

- 1 Remove the instrument cover:
 - a) Loosen the locking screws.
 - b) Open the quick-snap lockings.
 - c) Lift-off the cover.
- 2 Remove the cable box cover:
 - a) Loosen the 8 screws.
 - b) Remove the cover.
- 3 Visually check the cable box. Clean if necessary.
- 4 Re-install the cable box cover. Make sure that the seal ring fits correctly in the groove if the cover.
- 5 Replace the instrument cover.
 - Close the quick-snap lockings.
 - Tighten their locking screws.

LOT369

6 Trouble-shooting

Error messages:
Meaning &
Trouble-shooting

6.1 Error messages on the display

- When an error message is displayed, the menu operation is not blocked: Just press any key to remove the error message from the display and continue with normal menu operations, in order to find and remove the cause of trouble.
- If the cause of trouble remains, the error message will be displayed again when you return to the **Distance** display.

6.2 Possible error messages

Message	Meaning	Trouble-shooting
Adjustment span too small!	The difference between the programmed »0 %« and »100 %« values is too small.	The minimum difference is 0.25 meters. ▶ Adjust the settings (→ S. 27, §3.2).
Adjust. values exchanged!	The programmed »0 %« value is greater than the programmed »100 %« value.	▶ Adjust the settings (→ S. 27, §3.2).
Blocked LOT operates!	A sounding procedure is running. As a result, the selected menu function is temporarily not available.	Whenever the sensing weight is moving, the menu functions Draw in new cable , Simulation , Manual operation , and Calibrate system are not available. ▶ Wait until the sensing weight has returned to the basic position. ▶ Or press ESC to abort the sounding procedure.
Cable breakage!	Too much cable unwound, the cable is broken or the sensing weight is damaged.	Check the cable: <i>In case too much cable was unwound:</i> ▶ Use the Manual operation function (→ S. 37, »Service«) until the sensing weight does no longer touch the medium. Keep the cable strained by hand to provide correct winding. <i>In case of cable breakage:</i> ▶ Replace the cable (→ S. 40, §5.1).
Code invalid	The entered code is not valid for the desired function.	Codes are individual for each instrument and each option. Valid codes are available through the manufacturer's customer service.
Invalid length!	Error when drawing-in the cable. The pervious cable length will be kept stored.	–
Level < -1 %	The measured medium level is below –1 % of the programmed »0 %« value.	This is a status message, not an error message (→ S. 36, »Failure mode«). ▶ Visually check the real medium level.
Level > +101 %	The measured medium level is higher than 101 % of the programmed »100 %« value.	▶ Check the programmed »0 %« and »100 %« values, if necessary (→ S. 27, §3.2).
max. adjustment too high!	The programmed »100 %« value is greater than the available cable length.	The value must be smaller than the length of the cable drawn-in. The available length is shown in the Info menu (→ S. 36). ▶ Enter a value that is smaller than the available cable length.
min. adjustment too high!	The programmed »0 %« value is greater than the available cable length.	
Motor does not run!	Malfunction occurred in the internal drive mechanics.	▶ Check: – Is the cable correctly rewound? – Is the cable jammed or hooked in the vessel? – Is the motor supply cable intact? <i>If there is no malfunction there:</i> Motor or motor electronics might be defective. ▶ Call the manufacturer's customer service.

Message	Meaning	Trouble-shooting
Offset invalid!	The sounding measuring system is not correctly calibrated.	The previous offset value will be kept. ▶ Perform the system calibration again (→ S. 37, »Service«).
Password	Setting functions are locked – Password input requested.	▶ Enter 369 to deactivate the locking.
Sensor failure!	Malfunction occurred in the internal measuring devices.	▶ Switch-of the power supply for a few seconds (for an electronics reset). <i>If the error message remains:</i> An internal defect might have occurred. ▶ Call the manufacturer's customer service.
Weight covered!	The sensing weight is covered or hooked, and the automatic release procedure (→ S. 12) was unsuccessful.	▶ Release the sensing weight manually. ▶ Then start a new sounding procedure.

LOT369

7 Supplementary equipment

Stop bead
Cover
Heating

7.1 Adjustable stop bead

Function

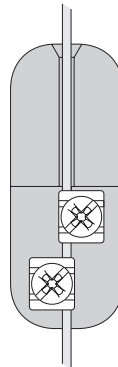
- With an adjustable stop bead installed on the cable (→ Bild 10), the basic position of the sensing weight is variable.
- If you use pulleys to make a special cable guidance, you will need an adjustable stop bead and a mechanical stop in front of the last pulley.

Installation

- 1 Use the **Manual operation** function (→ S. 37, »Service«) to unwind the cable until the adjustable stop bead can be installed on the required position.
- 2 Switch off the power supply of the LOT369.
- 3 Remove the cable load from the cable (sensing weight + gravity weight + stop beads → S. 40, §5.1).
- 4 Shift the adjustable stop bead on the cable up to the required position.
- 5 Fasten both fixing screws of the stop bead (→ Bild 10).
- 6 Re-install all parts of the cable load (→ S. 40, §5.1).
- 7 Switch on the power supply of LOT369.
→ When mains power is switched on, the LOT369 will wind the cable in until the adjustable stop bead reaches the mechanical stop. This position is the new basic position of the sensing weight.
- 8 Re-adjust the measuring range (→ S. 27, §3.2).

Bild 10

Adjustable stop bead



7.2

Protective cover

Function

The protective cover can be used against the sun or considerable temperature fluctuations. The protective cover has an isolating effect, compensates temperature fluctuations and supports the effect of an internal heating.

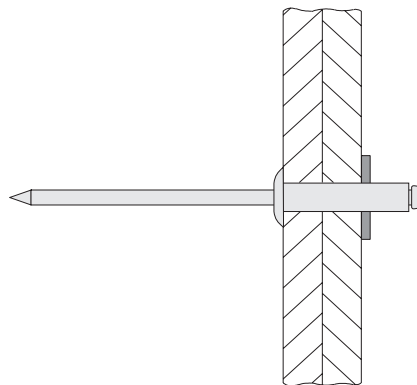
Installation

All required parts are enclosed in the set. Tools required are a drilling machine and standard blind riveting tongues.

- 1 Remove the instrument cover:
 - a) Loosen the locking screws.
 - b) Open the quick-snap lockings.
 - c) Lift-off the cover.
- 2 Place the protective cover over the instrument cover and shift the protective cover up to the aluminium rails.
- 3 Drill through the 6 holes of the protective cover, using a 4.1 mm drill.
- 4 Insert the blind riveting from outside through these holes. On the inside, place a washer disk on the blind riveting (→ Bild 11).

Bild 11

Pre-assembly of a blind riveting connection



- 5 Connect both covers with the 6 blind rivetings.
- 6 Replace the completed cover.
 - Close the quick-snap lockings.
 - Tighten their locking screws.

7.3

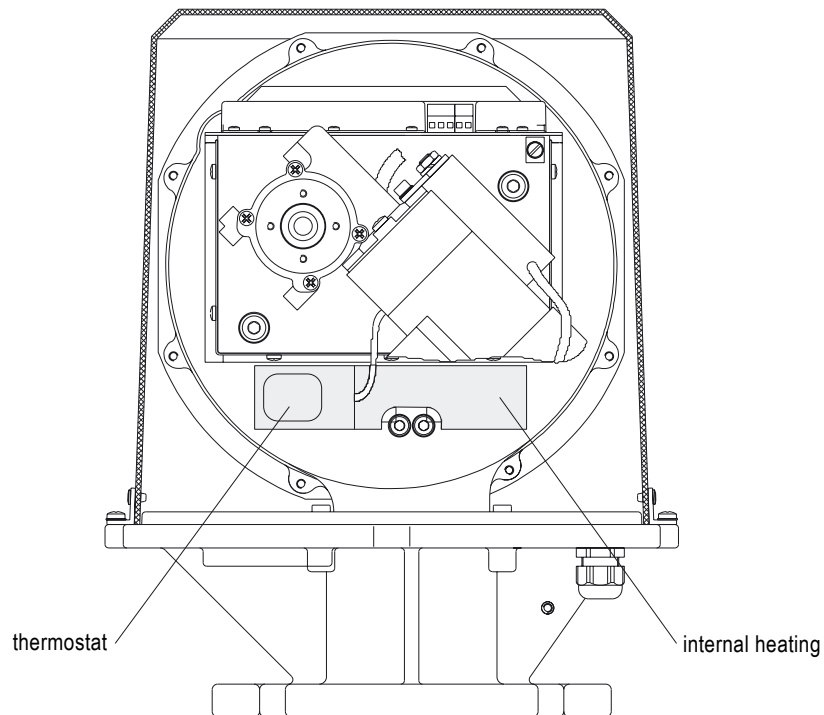
Internal heating

As an option, the LOT369 can be equipped with a thermostatically controlled internal heating. This heating can be also added afterwards. The internal heating consists of a flexible Silicone heating blanket with integral thermostat. The thermostat switches the heating element on at approx. 10 °C and off at approx. 40 °C.

- 1 Remove the instrument cover:
 - a) Loosen the locking screws.
 - b) Open the quick-snap lockings.
 - c) Lift-off the cover.
- 2 Clean the mounting surface for the heating blanket with a fat-solving detergent.
- 3 Mark the future position of the heating blanket on the mounting surface. Please note that the relieving must spare the two screws.
- 4 Remove the foil from the adhesive side of the heating blanket. Check if the adhesive on the heating blanket is okay.
- 5 Now carefully place the heating blanket to the marked surface – a full perfect contact should be made immediately (→ Bild 12).
- 6 Connect the two connection lines to terminals 18 and 19 (→ page 18, Bild 3).
- 7 Replace the instrument cover.
 - Close the quick-snap lockings.
 - Tighten their locking screws.
- 8 Wait for approx. two hours (adhesive should completely set).
→ Then the LOT369 can be started-up again.

Bild 12

Internal heating



LOT369

8 Preset pulse counter

Function
Specifications
Installation
Setup

8.1 Function of the preset pulse counter

The preset pulse counter is a front panel mounting device which can digitally indicate the medium level by counting the LOT369 counter output pulses (→ S. 19, §2.5.2).



For detailed information on the preset pulse counter, please refer to its separate user manual.

8.2 Technical data of the preset pulse counter

Size of digits (W × H):		4 × 5 mm, 3 digits
Protection:		IP 30
Electrical connections:		flat tongues 0.8 × 2.8 mm
Permissible ambient temperature:		−10 ... +50 °C (14 ... 122 °F)
Mains voltage:		230 V ±10 %, 50/60 Hz
Power consumption	counter:	2.75 VA
	reset magnet:	16 VA
Switching cycles	counter pulses:	2 × 10 ⁸
	reset pulses:	1.5 × 10 ⁶

8.3 Installation of the preset pulse counter

Mounting

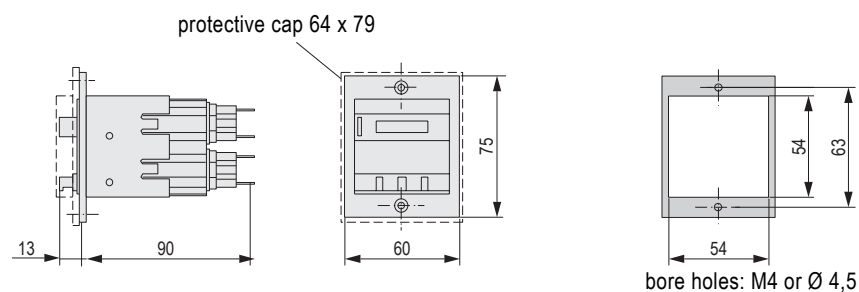
The preset pulse counter is designed for front panel mounting (→ page 52, Bild 13).

Signal connections

Exemplary wiring → page 18, Bild 4.

Bild 13

Preset pulse counter

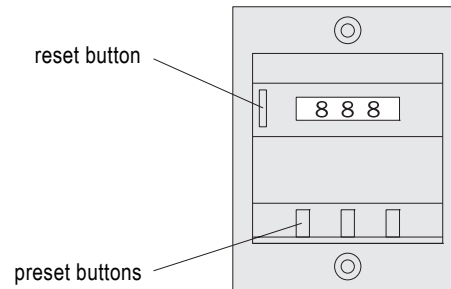


8.4 **Adjusting the preset pulse counter**

To produce a correct level reading, it is required to adjust the preset pulse counter to the maximum medium level (»100 %«) of your vessel.

- Keep the reset button depressed.
- Use the preset buttons to set the digital reading to the maximum medium level of the vessel (= height of sensing weight above vessel ground or above desired minimum medium level). The length unit is decimetres.

Bild 14 Operating the preset pulse counter



8.5 **Level indication at the preset pulse counter**

When a sounding procedure is started, the counter reading is automatically reset to the maximum medium level (→ §8.4). As long as the sensing weight is lowered into the vessel, the reading counts down from the maximum level, following the counting pulses of the LOT369. When the sensing weight is stopped on the medium surface, the reading freezes, indicating the medium level in decimetres.

LOT369

9 ATEX certificate

Bild 15 ATEX certificate for LOT369 version »Z«, sheet 1

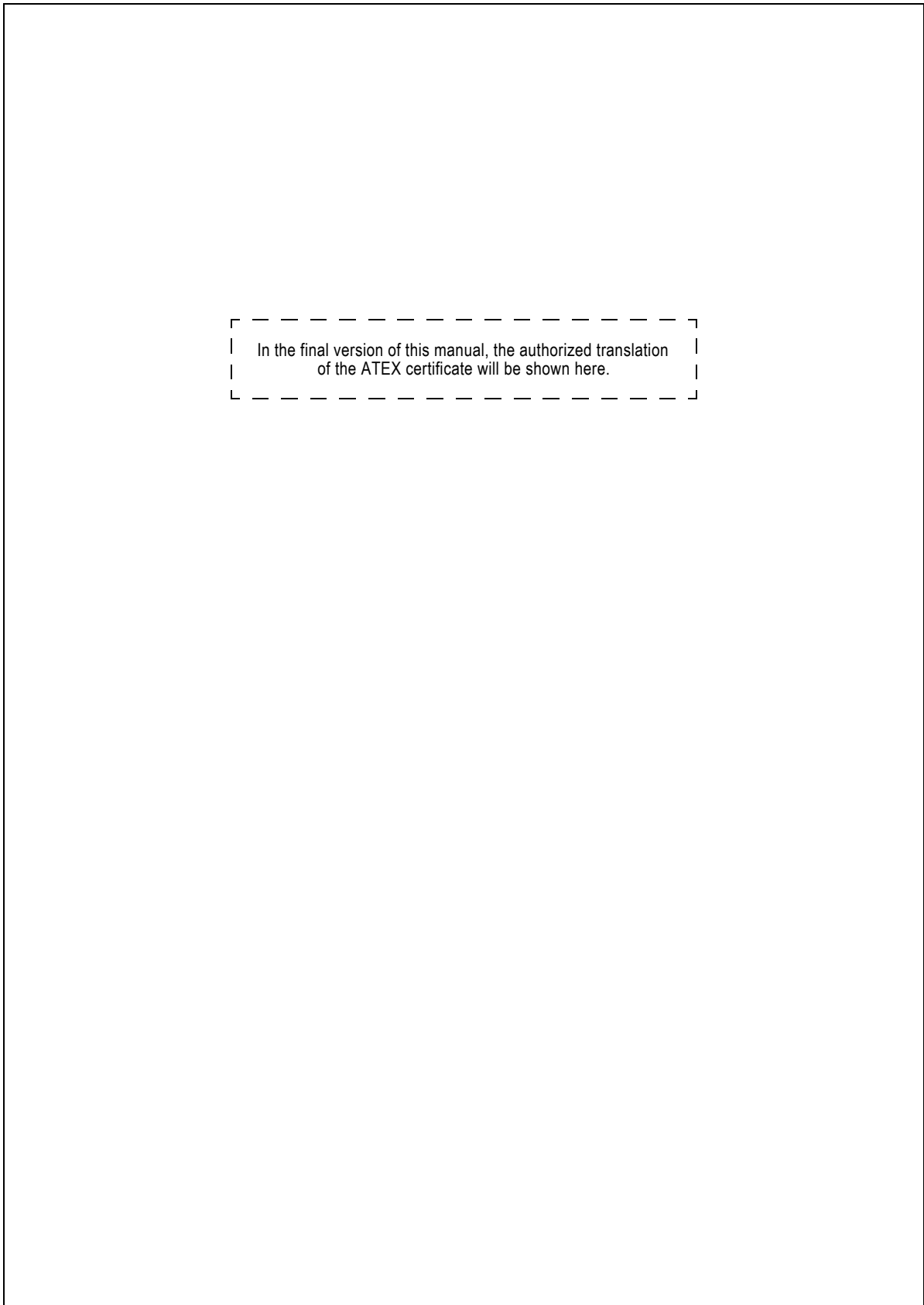


Bild 16 ATEX certificate for LOT369 version »Z«, sheet 2

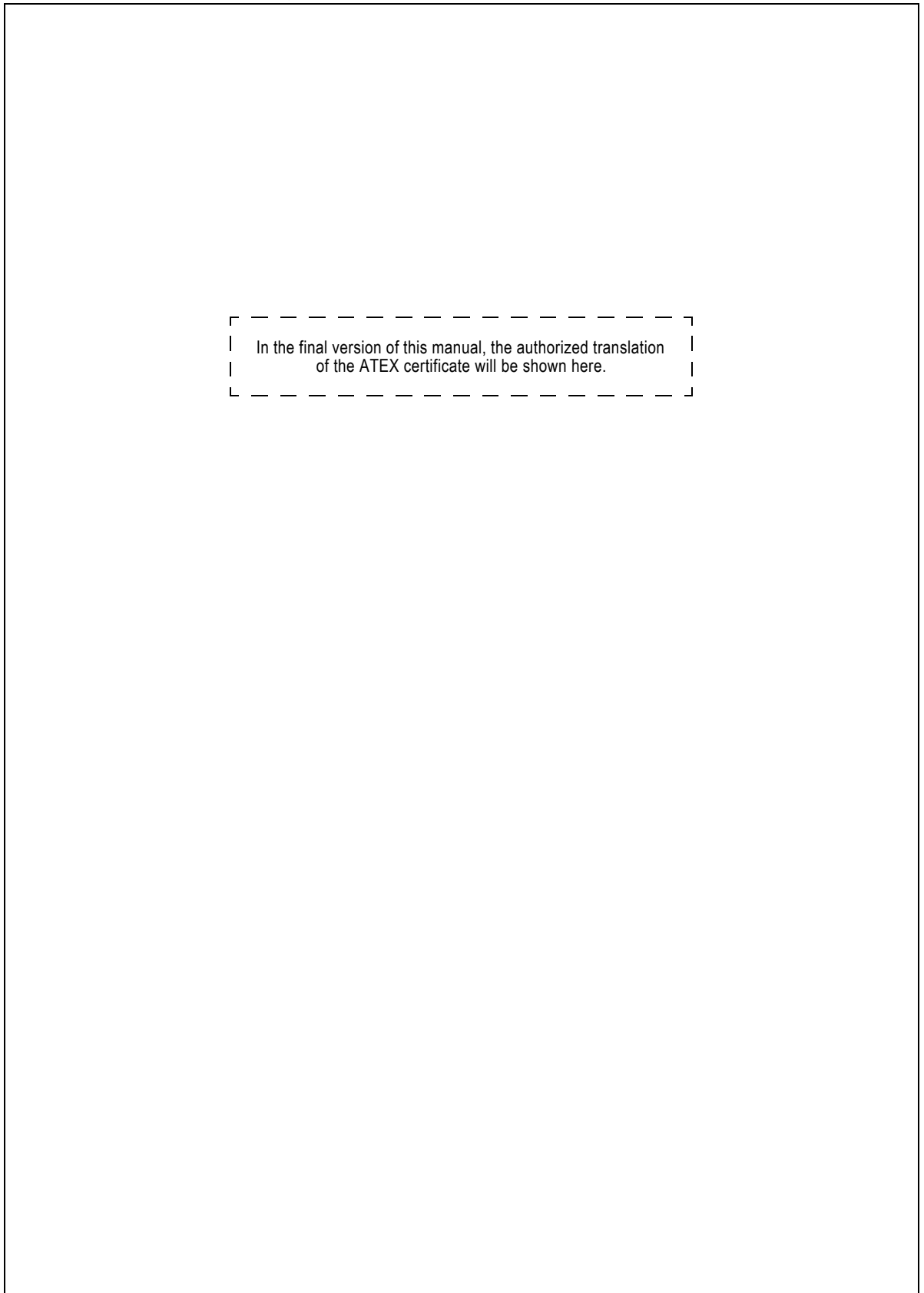


Bild 17 ATEX certificate for LOT369 version »Z«, sheet 3

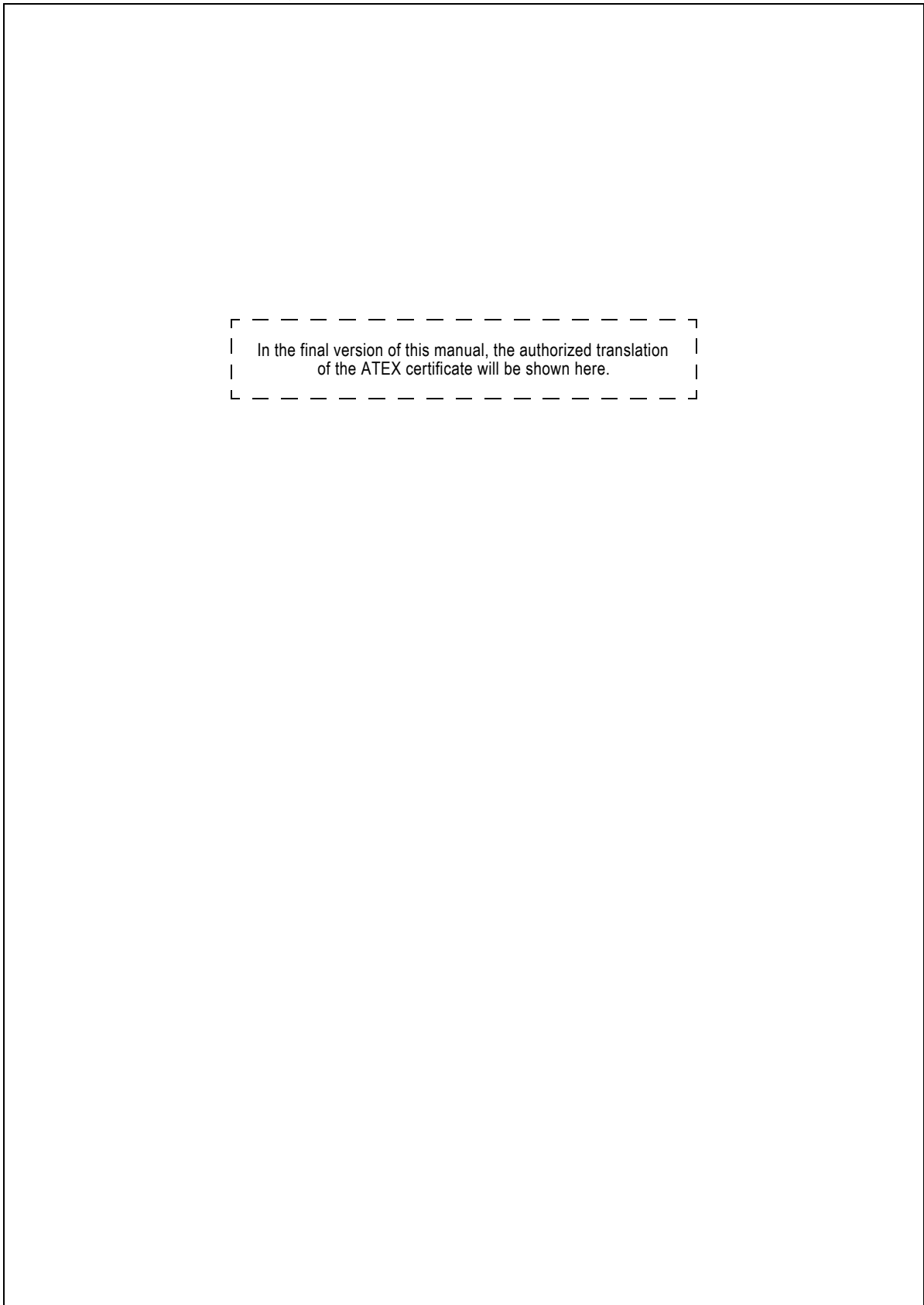
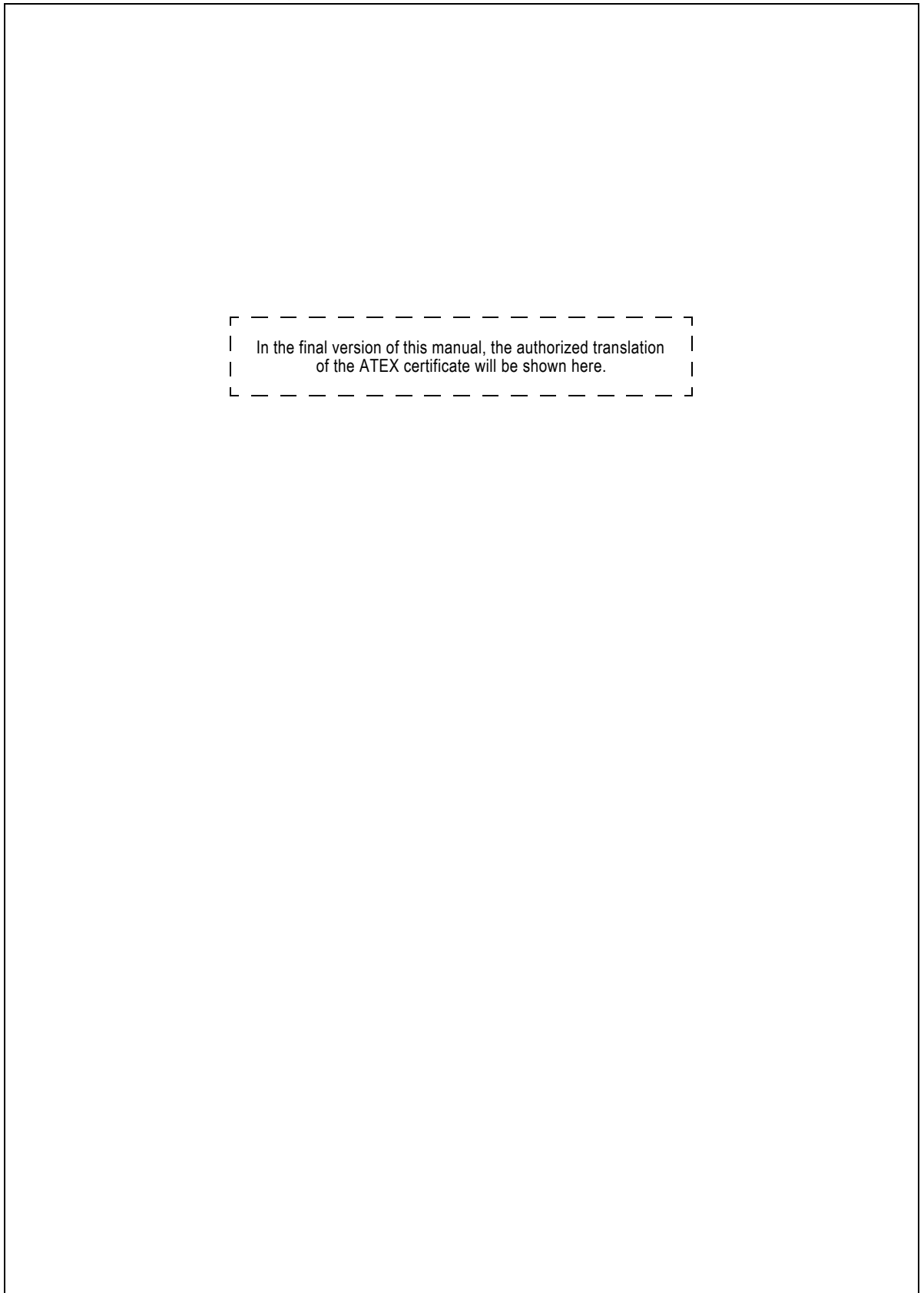


Bild 18 ATEX certificate for LOT369 version »Z«, sheet 4



LOT369

10 Technical Data

Ambient conditions
Mechanical data
Electrical data
Dimensions

General technical data

Total weight:	approx. 18 kg (40 lb.)
Lifting force:	max. 80 N
Cable speed:	0.28 m/s

Technical data of the enclosure

Materials	instrument cover:	ABS, PMMA
	flange, cable box:	aluminium
	protective cover: ¹	ABS, PMMA
Protection class	enclosure:	IP 65
	cable box:	IP 66
	with cover removed:	IP 20
	protective cover: ¹	IP 65
Flange	dimension:	DN 80 PN 10 ... DN 100 PN 10 (DIN 2501)
	material:	Aluminium
Cable glands	PG 13.5 (4 pieces)	
Wiring terminals	for wire dia. max. 1x 1,5 mm ²	

¹ Option

Technical data of the cable

Material:	stainless steel 1.4401
Diameter:	1 mm
Length:	max. 70 m
Breaking load:	650 N

Admissible ambient conditions

Ambient temperature around enclosure	standard:	-20 ... +60 °C (-4 ... +140 °F)
	with intern. heating:	below -10 °C (→ S. 50, §7.3)
Air humidity ¹	at 31 °C (88 °F):	max. 80 %
	at 40 °C (104 °F):	max. 50 %
Medium temperature	-40 ... +150 °C (-40 ... +300 °F) ²	
Storage and transport temperature	-40 ... +70 °C (-40 ... +160 °F)	
Operating pressure	standard:	unpressurized (max. 0.2 bar)
	optional:	max. 2 bar

¹ values for intermediate temperatures to be calculated by linear regression

² see also S. 15, §2.3

Sensing weights

Type ¹	Material	Gravity weight	Max. temperature	
A Plastic weight (Standard)	PVC	PVC	60 °C	140 °F
B Aluminium weight	Al	Al	150 °C	300 °F
C StSt weight	1.4571	1.4571		
F Perforated weight	1.4571	PVC	100 °C	210 °F
D Spider weight VA	1.4301	PVC		
O Spider weight PE	PE	PVC	60 °C	140 °F
E Bag weight	linen ²	PVC	80 °C	175 °F

¹ dimensions → page 65, Bild 20; application range → S. 11, §1.4.1

² delivered filling: plastic granulate

Mains power supply

Mains voltage	standard:	230 VAC ±10 %
	optional:	42/48/115/130/250 VAC ±10 %
Mains frequency:		48 ... 62 Hz
Power consumption ¹	standard:	200 VA
	with internal heating: ²	240 VA
Protective measures	protection class:	I
	overvoltage category:	III

¹ at 230 VAC mains voltage

² option

Control inputs

Operation voltage:	20 VDC, max. 5 mA
--------------------	-------------------

Relay switch contacts

Minimum load of the relay switch contacts:		10 mV, 10 µA
Maximum load for the relay switch contacts	function »LOT runs«, »fault«	AC: 250 VAC, 5 A, 750 VA DC: 250 VDC, 1 A, 54 W
	function »counter output« (REL1)	250 VAC, 0.2 A
	function »reset counter« (REL2)	250 VAC, 3 A, 500 VA
function »counter output«	pulse frequency:	2.8 Hz
	switch-on pulse width:	100 ms
function »counter reset«	switch-on pulse width:	200 ms

Measuring value output (»current output« option)

Measuring value output	active:	0/4 ... 20 mA ¹ ; load: 0 ... 500 Ω
	passive:	U _{IN} = 8 ... 36 VDC, 0/4 ... 20 mA ¹

¹ alternatively (→ S. 33, § 4.3.4)

Conformity (CE)

The LOT369 meets the protective regulations of EMVG (89/336/EWG) and NSR (72/23/EWG). The conformity has been judged according to the following standards:

- EMVG:emission: EN 50081-1: 1992
immission: EN 50082-2: 1995
- NSR: EN 61010-1: 1993

Differing technical data for instrument version »Z«

- StEx approval (Zone 20 and 21): BVS 03 ATEX E 268
- Protection: IP 54
 - cable box: IP 65
 - without cover: IP 20
- Max. permissible surface temperature at 40 °C ambient temperature
 - without heating: 72 °C (161 °F)
 - with heating: 80 °C (176 °F)
- Only applicable with PVC weight, bag weight, or spider weight (PE).

Dimensions

Bild 19

Dimensions

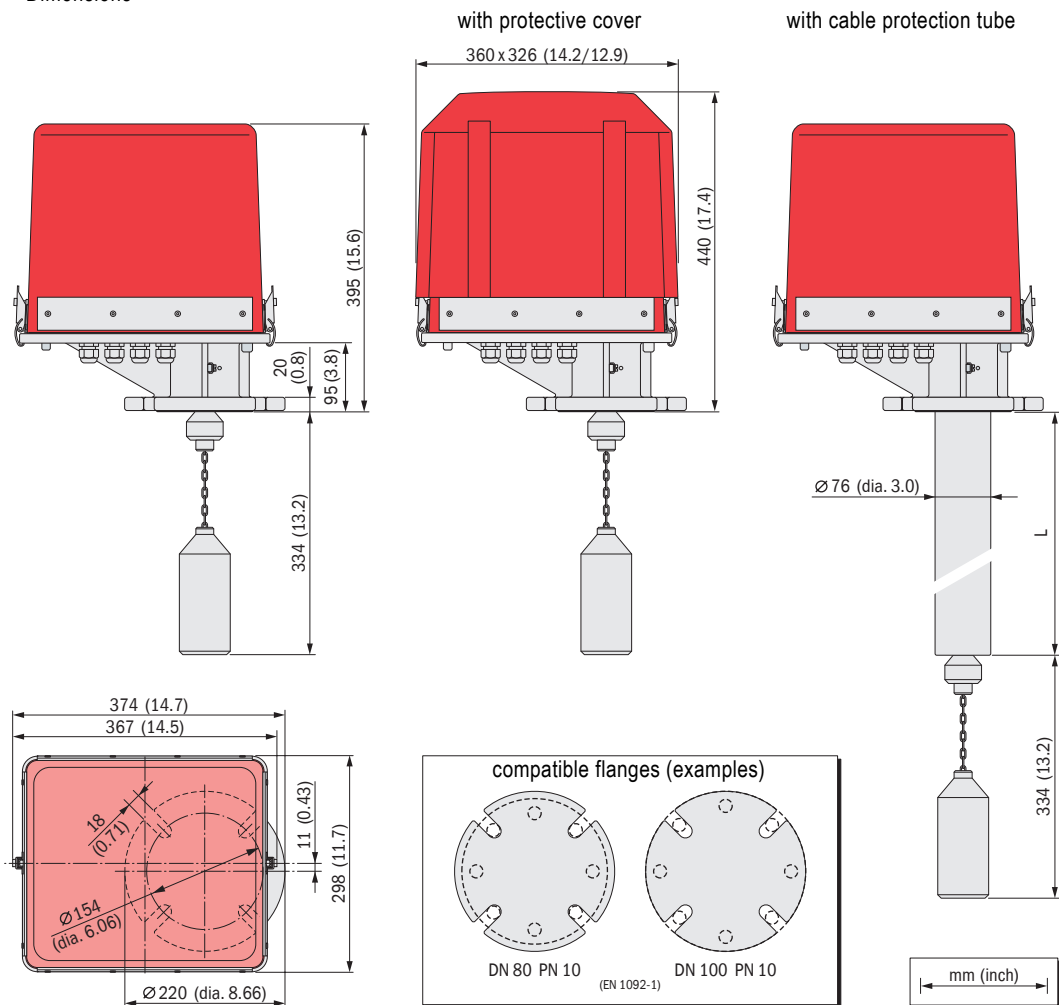
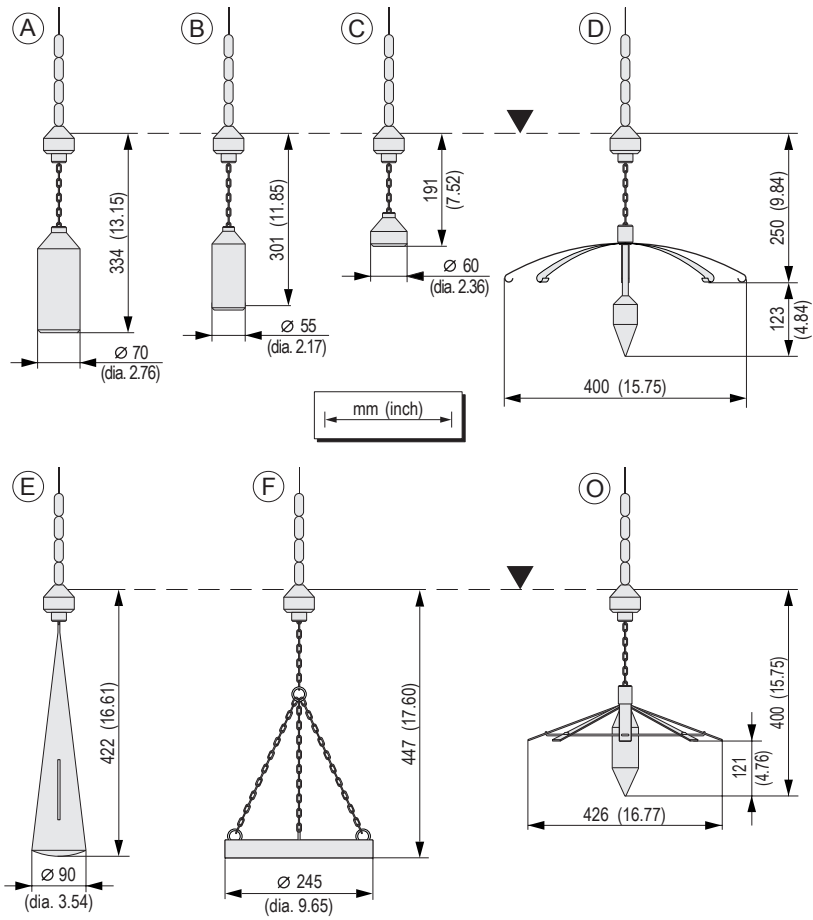


Bild 20

Sensing weights



A	
Active	34
Adaptation	25
Additional functions (menu)	36
Adjust. values exchanged (display message)	44
Adjustable stop bead	48
Adjustment	
- menu function	33
- procedure	27
Adjustment in ... (menu)	33
Adjustment span too small (display message)	44
Ambient temperature	15
ATEX certificate	55
B	
Basic position	
- for »Hover« mode	35
- indication	30
- variation	48
Blocked LOT operates (display message)	44
C	
Cable	
- length (info display)	36
- replacing procedure	40
- technical data	62
Cable breakage (display message)	44
Cable diameter	18
Cable glands	23
Cable protection tube	16
Cable pulleys	17
CE label (conformity)	63
Certification	8, 56 - 59
Cleaning the cable box	42
Climatic conditions at the place of use	15
Code invalid (display message)	44
Conformity	63
Control inputs	20
Counter pulses	
- activation	34
- output	19
Counter reset (output)	19
Current output	21
- failure mode (setting)	36
D	
Designated users	9
Dimensions	
- instrument	64
- sensing weights	65
Display	
- medium level indication	30
- possible error messages	44
Distance (display message)	33
DMT certificate	8
Draw in new cable (menu)	37
Dust-Ex certification	8
E	
Electrical connections	18
Ex certification	8
Exemplary wiring	18
Explosion-hazardous locations	8
F	
Failure mode (menu)	34, 36
Fault (relay output)	19
Float (sounding mode)	35
Function (general)	8
Functional principle	10
G	
Glossary	2
Gravity weight	12
H	
Heating	50
Hover (sounding mode)	35
I	
Info (menu)	36
Information symbols	3
Installation	13
- electrical connections	18
- exemplary wiring	18
- individual adaptation	25
- power supply	22
- special cable guidance	17
- standard mounting	16
- wiring terminals	18
Intended use	8 - 9
Invalid length (display message)	44
K	
Key functions	31
L	
Language (menu)	36
Level < -1 % (display message)	44
Level > +101 % (display message)	44
Limitations of use	8
LOT runs (relay output)	20
M	
mA output	21
- menu	34
Mains connection	22
Maintenance	
- cleaning the cable box	42
- replacing the cable	40
Manual operation (menu)	37
max. adjustment too high (display message)	44

Measuring range (setting)	27	Safety notes on	
Measuring value (medium level indication)	33	- electrical safety	14, 26
Measuring value output	21	Sensing weight	
Medium level		- dimensions	65
- indication on preset pulse counter	53	- materials, temperatures	62
- indication on the display	33	- structure	12
Menu system (overview)	32	Sensor failure (display message)	45
min. adjustment too high (display message)	44	Service (menu)	37
Model test certificate	8	Settings	
Motor does not run (display message)	44	- individual adaptation	25
Mounting	16	- mA output	34
- non-horizontal flange	17	- measuring range	27
- special cable guidance	17	- preset pulse counter	53
O		- prior to installation (recommended)	14
Offset invalid (display message)	45	Signal words	3
ON (control input)	20	Simulation	35
Operation	29	Software version (info display)	36
- bar graph indication	30	Sounding mode («Run state» menu)	35
- display and keyboard	30	START (control input)	20
- display operation	30	Start sounding	33
- key functions	31	Start-up	30
Output mode (menu)	34	Steel chain	12
Outputs (menu)	34	Stop beads	12
P		Suitable cables	18
Parameter adjustment (menu)	33	Supplementary equipment	47
Parameter settings	see »Settings«	Switch functions	
Passive	34	- counter pulses	19
Password (activation)	36	- counter reset	19
Password (display message)	45	- fault condition	19
Pneumatic connection	24	- LOT runs	20
Power supply	22	- permissible electrical load	20
Preset pulse counter	51	Switch outputs	19
Protective cover	49	Symbols (explanation)	3
Pulleys	17	T	
Pulse counter	see »Preset pulse counter«	Target group (users)	9
Purpose of the instrument	8	Technical Data	61
R		Terminals	18
REL1, REL2 (switch function)	19	Timer	35
Relay 2 (menu)	34	Trouble-shooting	43
Relay counter output (menu)	34	U	
Relay switch outputs	19	User	
Reset (menu)	36	- designated users	9
Reset pulse		- user's responsibility	9
- activation	34	Users (target group)	9
- output	19	W	
Resolution (info display)	36	Warning symbols, warning levels	3
Run state (sounding mode)	35	Weight covered (display message)	45
S		Wiring terminals	18
Safety notes		Z	
- for installation	14	Zone 20	8, 63
- for operation	26		

LOT369

80114/2009-03 (V1.3-[final preversion])

MBA Instruments GmbH
Friedrich-List-Str. 5 | 25451 Quickborn | Germany | www.mba-instruments.de
Phone +49 (0) 41 06 123 888-0 | Fax +49 (0) 41 06 123 888-9 | info@mba-instruments.de

