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Subject to technical change.  
 All dimensions in inches (mm).

All units in this information are CE-certified.

We assume no liability for typing errors.  
 Different variations to those specified are possible.  
 Please contact our technical consultants.

## Safety notes / Technical support

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### Notes

- Installation, maintenance and commissioning must be carried out only by qualified technical personnel.
- The product must be used only in the manner outlined in this instruction manual.

Special attention must be paid to warnings and notes as follows:



#### WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

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#### WARNING

Relates to a caution symbol on the product and means, that a failure to observe the necessary precautions can result in death, serious injury and/or considerable material damage.

This symbol is used, when there is no corresponding caution symbol on the product.

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#### CAUTION

A failure to observe the necessary precautions can result in considerable material damage.

### Safety symbols

In manual and on product	Description
	CAUTION: refer to related documents (manual) for details.
	Earth (ground) Terminal
	Protective Conductor Terminal

### Technical support

Please contact us at:

Maxi-Tronic, Inc.  
417 Wards Corner Rd.  
Loveland, OH 45140  
USA

Tel. 800-659-8250  
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info@maxitronic.com  
www.maxitronic.com

## Introduction

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The LevelMax is an electromechanic level measuring instrument for continuous measuring of level or volumes in silos, hoppers or tanks.

## Applications

- Powder, grain, small or coarse bulk goods

Applicable for industries such as

- Grain
- Food
- Cement
- Plastics
- others

## Features

### Process

- Suitable for most types of bulk goods
- Independent of bulk material properties, such as:
  - Dielectricity and conductivity of the bulk good
  - Dusty atmosphere in the silo
  - Changing humidity inside the product
  - Products that tend to stick
- No mechanical load on the silo roof, the sensor weight just touches the surface of the material
- Accurate measurement

### Service

- Simple installation and commissioning
- Measurement principle is easy to understand
- Rope, tape with increased service life
- Low maintenance

### Approvals

- Approval for use in Hazardous Locations  
FM Class. II, III Div.1 Groups E–G

### Mechanical

- Measurement range upto 100ft (30m), longer on request.
- 1 1/2" process connection possible
- Aiming flange to be mounted directly on a flat silo roof
- Internal tape cleaner for difficult materials
- Robust cast housing, ingress protection Nema 4 and IP66 (similar to NEMA 4X)

### Electronics

- Microprocessor controlled measurement
- Diagnostics routines
- Output 4–20mA
- Two programmable Relays (can be used as Counting pulse output or as Failure / Upper stop position)
- Measurement start with external signal or integrated timer

## Function

The LevelMax is mounted on the top of the silo. A sensor weight is lowered down into the silo. It is mounted at the end of a rope or tape which is wound on a motor driven roller. Upon contact with bulk material, the motor changes the winding direction and the sensor weight is driven back to the upper stop position.

During downwards movement of the sensor weight the distance is electronically measured by the rotations of the internal rope / tape roller. The microcontroller converts the measured distance into an output signal, which is a volumetric signal based on the silo geometry. The output signal is updated, when the sensor weight touches the bulk material.

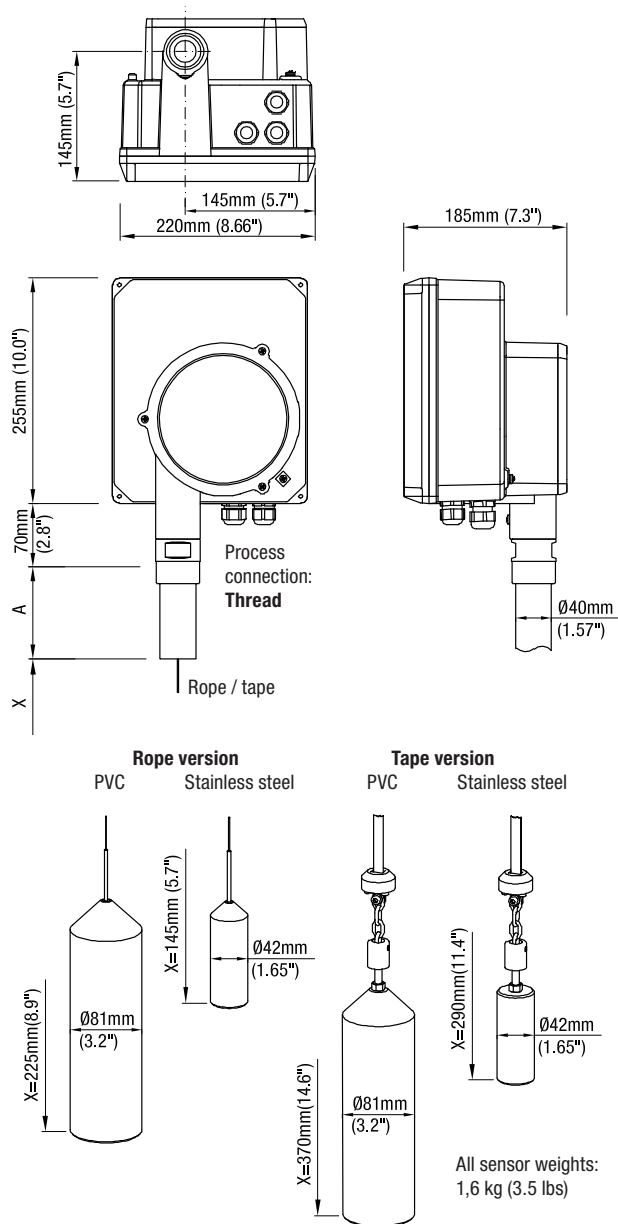
## Diagnostics

Comprehensive diagnostics possibilities are included:

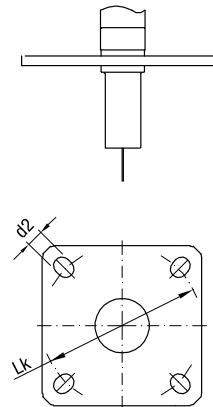
- Measurement control is done by comparing the moved distance between up and downward movement and checking for discrepancy. In case of discrepancy, the sensor weight is pulled to the upper stop position to ensure, that the sensor weight is not inside the silo.
- Service interval after a certain amount of measurements and run time.
- Internal control of motor and motor driver electronic.

Diagnostics is in accordance with NAMUR recommendation NE107.

## Dimensions and materials

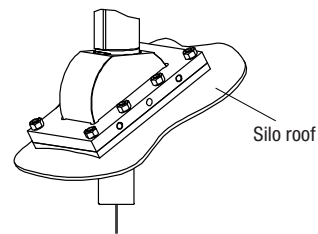


Process connection: **Flange**



Process connection: **Aiming flange**

To be screwed directly to the silo roof  
0°-50° adjustable  
Including screws, nuts and sealing



Flange plate outside dimensions:  
Width x Height: 120mm x 180mm (4.7"x7.1")

### Dimensions

<b>X</b> = Length to bottom of sensor weight (in upper stop position)	
<b>A</b> = Length of socket pipe 3.9" (100mm) Optional 7.9" (200mm) / 19.7" (500mm) / 39.4" (1000mm)	
<b>Flanges</b>	
fitting to: DN100 PN16 / 4" 150lbs	Lk = 7.1-7.5" (180-190.5mm) slot d2 = 0.75" (19mm)
fitting to: 2" / 3" 150lbs	Lk = 4.75-6.0" (120.7-152.4mm) slot d2 = 0.75" (19mm)
<b>Rope</b>	0.49" (1.25mm)
<b>Tape</b>	0.47x0.008" (12x0.2mm)

### Materials

<b>Housing outside</b>	Aluminum, outside powder coated
<b>Thread / Flange</b>	Aluminum
<b>Aiming flange</b>	304 Aluminum / (1.4301)
<b>Rope</b>	304 (1.4301)
<b>Tape</b>	310 Stainless Steel (1.4310)
<b>Sensor weight</b>	PVC or 303 Stainless Steel (1.4305) Fixing elements between tape and sensor weight: aluminum / 303 Stainless (1.4305)

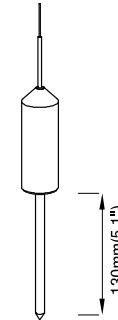
## Options and Accessories

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### Options

#### Pin for sensor weight

Recommended for powder  
The pin penetrates into the material and avoids slipping or tilting of the sensor weight on the steep bulk surface.

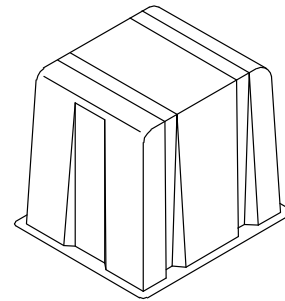


#### Weather protection cover

If the unit is used outdoors, the use of the weather protection cover is recommended. It protects the device from all atmospheric conditions such as

- rain water
- condensation water
- excessively high temperatures
- excessively low temperatures in winter

Material: PE, weather and temperature stable



### Accessories

#### Mounting kits

##### Material for mounting the unit on a flange

Sealings, screws and washers

##### Adapter NPT 1 1/2" to NPT 3"

Aluminum

For mounting the unit on a 3" ferrule  
Thread tapered ANSI B1.20.1



## Technical data

### Electrical data

<b>Power supply</b>	AC version 115V or 230V 50-60Hz +10% / -15% (incl. 10% of EN 61010) DC version 20 .. 28V (incl. 10% of EN 61010)																		
<b>Installed load</b>	<b>AC version:</b> 150 VA (including internal heater (80W))  <b>DC version:</b> One unit: 150W (with or without internal heater) * Further units which are connected to the same power supply: 25W per unit (without internal heater, motor off) ** 50W per unit (without internal heater, motor running) 80W per unit (with internal heater, supply voltage 20V DC) 100W per unit (with internal heater, supply voltage 24V DC) 120W per unit (with internal heater, supply voltage 28V DC)  *Considers the max. motor traction which is needed in a failure condition. A failure condition is assumed for max. one unit at the same time. ** This value can be considered, if the controlling PLC starts the measurement for max. one unit at the same time.																		
<b>Signal output: 4-20mA</b>	Max. 500 Ohms (active, isolated) Linearity +/- 0.1mA																		
<b>Signal output: Relays</b>	Optional: 1x Relays SPST and 1x Relays DPDT max. 250V AC, 2A, 500VA non inductive																		
<b>Accuracy of measurement</b>	<table border="1"> <thead> <tr> <th>Output</th> <th>Measuring range</th> <th>Accuracy Rope version</th> <th>Accuracy Tape version</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Counting pulse</td> <td>&lt; 33ft (10m)</td> <td>2 pulses</td> <td>1 pulse</td> </tr> <tr> <td>&lt; 66ft (20m)</td> <td>3 pulses</td> <td>2 pulses</td> </tr> <tr> <td>&lt; 100ft (30m)</td> <td>5 pulses</td> <td>3 pulses</td> </tr> <tr> <td>4-20mA</td> <td>&lt; 100ft (30m)</td> <td>1.5% of measured length</td> <td>1% of measured length</td> </tr> </tbody> </table>	Output	Measuring range	Accuracy Rope version	Accuracy Tape version	Counting pulse	< 33ft (10m)	2 pulses	1 pulse	< 66ft (20m)	3 pulses	2 pulses	< 100ft (30m)	5 pulses	3 pulses	4-20mA	< 100ft (30m)	1.5% of measured length	1% of measured length
Output	Measuring range	Accuracy Rope version	Accuracy Tape version																
Counting pulse	< 33ft (10m)	2 pulses	1 pulse																
	< 66ft (20m)	3 pulses	2 pulses																
	< 100ft (30m)	5 pulses	3 pulses																
4-20mA	< 100ft (30m)	1.5% of measured length	1% of measured length																
<b>Display</b>	LCD																		
<b>Indication light</b>	Status by built in LED: Power On, Relay, Failure																		
<b>Memory</b>	Non-volatile (no backup battery required) > 10 years data retention																		
<b>Connection terminals</b>	AWG 26 .. 14 (0.14 .. 2.5mm <sup>2</sup> )																		
<b>Cable entry</b>	According to selection: Screwed cable gland: 1x M20x1.5 and 1x M25x1.5 Blindplug: 1x M20x1.5 or Conduit ANSI B1.20.1: 1x NPT 3/4"+ 1x NPT 1/2" Blindplug: 1x NPT 1/2"																		
<b>Isolation</b>	Power supply to all other outputs / inputs: AC version 2210 Vrms DC version: 1000 VDC  Relay to relay: 2210 Vrms																		
<b>Protection class</b>	I																		

### Mechanical data

<b>Ingress protection</b>	IP 66, Type 4 (NEMA 4)
<b>Process connection</b>	Threads: NPT 1 1/2" ANSI B1.20.1 tapered R 1 1/2" DIN 2999 tapered, (Adapter for NPT 3" available)  Flanges: 2" or 3" or 4" 150lbs ANSI B16.5 (unit fits to this flange) DN100 PN16 EN1092-1 (unit fits to this flange) Aiming flange: To be mounted directly on a flat silo roof

## Technical data

<b>Color</b>	Housing Lid	RAL 5010 (gentian blue) RAL 9006 (aluminum silver)
<b>Material</b>	See detail specifications on page G4	
<b>Measuring range</b>	Max. 50ft (15m) or max. 100ft (30m)	
<b>Measuring speed</b>	Sensor weight speed in average: 0.6ft/sec (ca. 0,2 m/s)	
<b>Weight</b>	With thread: 20lbs (ca. 9kg) With flange: 24lbs (ca. 11kg)	
<b>Deviation of vertical mounting</b>	max. 2°	

## Operating conditions

<b>Process overpressure</b>	-3.0 ..+3.0psi (-0.2 ..+0.2bar)	
<b>Process temperature</b>	-40 ..+176°F (-40°C ..+80°C)	
<b>Ambient temperature</b>	-4 .. +140°F (-20°C .. +60°C) -40 .. +140°F (-40°C .. +60°C) -40 .. +140°F (-40°C .. +60°C)	CE, FM General Purpose, with internal heater FM Class II available on request
<b>Min. powder density</b>	> 18 lb/ft <sup>3</sup> (300 g/l) This specification is a guideline and is valid for material which has settled after filling. During filling the bulk density can change (e. g. for fluidized material).	
<b>Minimum time between measuring starts</b>	measuring height 16ft (5m) -> 3min measuring height 33ft (10m) -> 6min measuring height 66ft (20m) -> 12min measuring height 98ft (30m) -> 18min	
<b>Rope/tape operating time</b>	see page G19	
<b>Max. permitted tractive force</b>	180 lb-force (ca. 800N)	
<b>Relative humidity</b>	0-100%, suitable for outdoor	
<b>Altitude</b>	max. 6,562ft (2000m)	

## Approvals

<b>Hazardous Locations*</b>	FM Class. II, III Div.1 Groups E-G	
<b>General purpose *</b>	FM CE	General purpose EN 61010-1
<b>EMC</b>	EN 61326 -A1 (industrial standard)	

\* Depending on selected version in pricelist

## Mounting

### ! General Safety Instructions

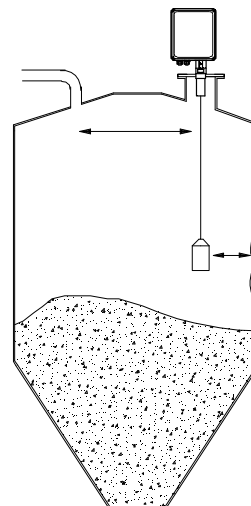
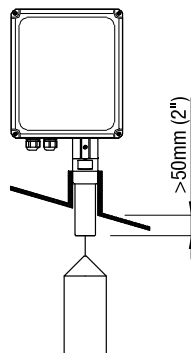
<b>Process pressure</b>	Improper installation may result in loss of process pressure.
<b>Chemical resistance against the medium</b>	Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.
<b>Mounting location</b>	The right mounting place is significant for a proper function. Observe mounting instructions.
<b>Vibrations</b>	Avoid mounting in applications with strong vibration. Use rubber mounts for absorption in case of light vibrations.

### ! Additional Safety Instructions for Hazardous Locations

<b>Installation regulations</b>	For devices to be used in Hazardous Locations the respective valid installation regulations must be observed.
<b>Sparks</b>	The installation has to be done in a way, that mechanical friction or impact does not cause sparks between the aluminum enclosure and steel.

## Mounting instructions

- Mounting position**
- The unit is mounted vertically on the silo. Max. deviation is 2°.
  - There must be at least 7.87" (200mm) space for the sensor weight to move down in case of a full silo. Observe the bottom of the sensor weight at "upper stop position" (dimensions see page G4).
  - The socket pipe of the unit must protude at least 2" (50mm) into the silo. A version with longer socket pipe is available.
  - Proper movement of the sensor weight must be guaranteed, even if the sensor weight oscillates. Observe enough distance to the silo wall, stanchions and built-in fittings.



**Measurement during filling of the silo** Filling of the silo while measuring might cover the sensor weight with bulk material. Measurements during filling are possible, if there is enough distance to the infeed, so that no material can fall on the sensor weight.

- Sealing**
- A rubber seal must be used to tighten the thread or flange.
  - Close both lids of the enclosure tightly.



## Mounting with aiming flange

### Mounting with aiming flange

The aiming flange allows to mount the unit directly on the roof of a silo without the need of a socket.



When working on a silo roof, take precautions according to the valid safety regulations to avoid, that persons can fall down.

1. Find the right mounting position (see page before).  
To ensure a proper sealing of the rubber on a shaped silo roof, the distance "R" from the center of the silo to the mounting position must be  $> 20"$  (500mm).

2. Mark ten drilling holes "A" and the cutaway "B" with a marker on the silo roof. Use the attached template.



While doing the next steps 3. and 4., ensure that no debris or any parts can fall into the silo.

3. Drill ten holes "A" with a  $3/8"$  (9.5mm) drill.  
Use a cut-off grinder to grind out the shape "B". Before doing this, drill a bigger hole in the middle of "B", where you can hold the cut plate to avoid it falling into the silo when it is cut loose.

4. Insert the clamping plate from inside the silo and mount with two screws "C"

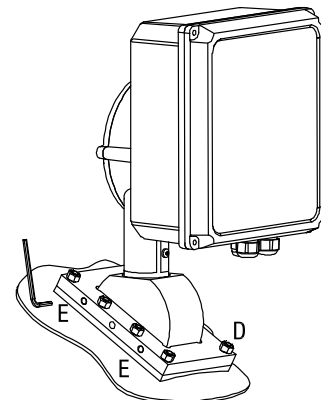
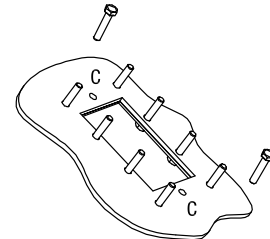
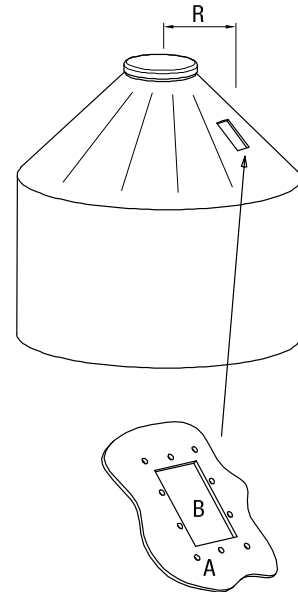
5. Apply the rubber seal from outside over the shafts.  
Take care that the shaped side faces to the (shaped) silo roof and the knobs faces upwards..



If the sealing is fixed in the wrong direction, the sealing may not be water and dust tight.

6. Mount the LevelMax unit.  
Fix equally and crosswise all the eight nuts "D", first with a low torque, increase up to a torque of 2Nm

7. Adjust the unit to a vertical position (deviation of max.  $2^\circ$ ) by using a water level. Fix two screws "E" with a torque of 15Nm.



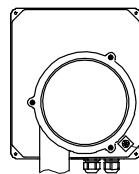
## Electrical installation

### ! General Safety Instructions

<b>Handling</b>	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
<b>Installation regulations</b>	All local and applicable regulations must be observed.
<b>Fuse</b>	Use a fuse as stated in the connection diagrams.
<b>Circuit protection</b>	In case of a fault, the supply voltage must be automatically switched off by a circuit breaker to protect against indirect contact with dangerous voltages.
<b>Power supply switch</b>	A voltage disconnection switch must be provided near the device.
<b>Wiring diagram</b>	The electrical connections are made in accordance with the wiring diagram.
<b>Supply voltage</b>	Compare the supply voltage applied with the specifications given on the name plate before switching the device on.
<b>Conduit system</b>	When using a NPT threaded conduit systems the regulations of the country, where the unit is installed, must be observed. The conduit must have a tapered thread either NPT 1/2" or NPT 3/4" in accordance with the unit and ANSI B 1.20.1. Unused inlets must be closed tight with a metal plug.
<b>Field wiring cables</b>	All field wirings must have insulation suitable for at least 250V AC. The temperature rating must be at least 176°F (80°C).
<b>Relay protection</b>	Provide protection for relay contacts to protect the device against inductive load surges.
<b>Protection against static charging</b>	The housing of the unit must be grounded to avoid static charging of the unit. This is particularly important for applications with pneumatic conveying and non-metallic containers.

### ! Additional Safety Instructions for Hazardous Locations

**External Ground bonding terminal**



Connect to Earth Ground of the plant

**Field wiring** A strain relief must be provided for the field wiring cables, if the device is installed with the factory provided cable glands.

The used entry fitting and plugs must have an adequate type approval and a temperature range as defined in the technical data of the unit. In addition they shall be suitable for the conditions and correctly installed. Where applicable the provided original parts of the manufacturer must be used.

**Conduit system for FM Hazardous Locations**

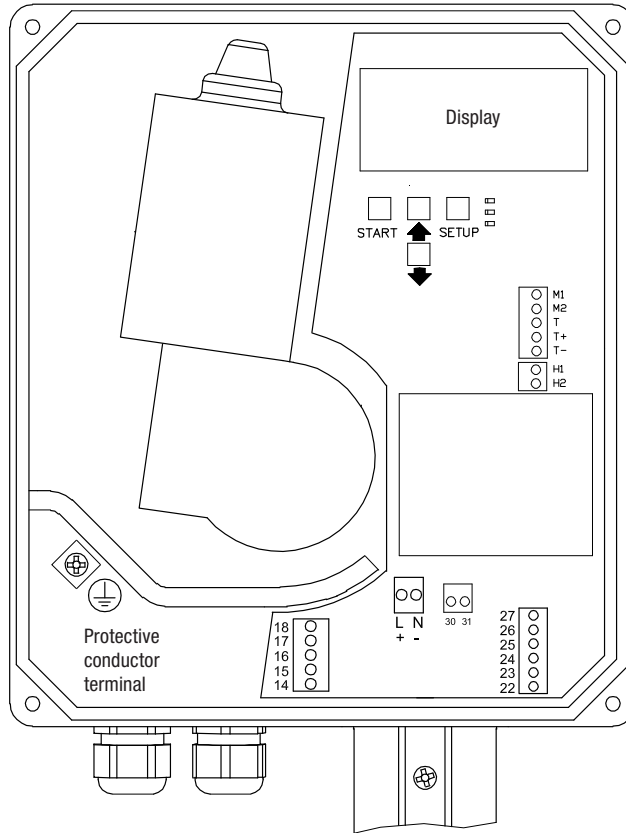
In addition the regulations of the country must be observed. The used flameproof seals and blanking elements must have an adequate type approval and a temperature range as defined in the technical data of the unit. In addition they shall be suitable for the conditions and correctly installed. Where applicable the provided original parts of the manufacturer must be used.

**Commissioning / opening the lid**

Commissioning only, when there are no dust deposits or swirls present.

## Electrical installation

### Terminal locations



Internal terminals for motor and heater

Terminals for:

- Power supply
- 4-20mA output
- Relay output
- Start input

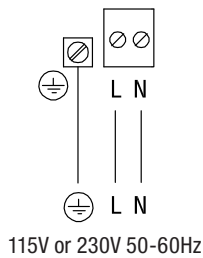
All terminals AWG 26 .. 14  
(0.14 .. 2.5mm<sup>2</sup>)

Note: Terminal 30 and 31 are not used

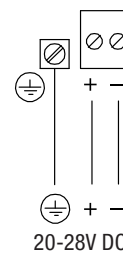
### Power supply and Signal input /output

#### Power supply

#### AC version

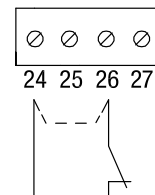
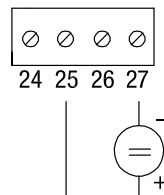
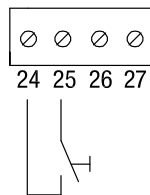


#### DC version



AC or DC supply depending on ordered version

#### Signal input: Start of measurement



Start contact

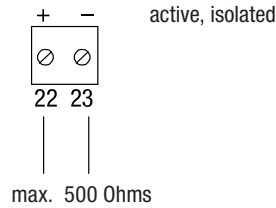
Start +24V

alternative

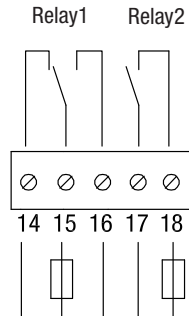
Measurement interruption in case of filling. If used, remove factory provided connection.

## Signal overview

**Signal output:**  
 0/4-20mA



**Signal output:**  
**Relays**  
 (optional)



Fuse: max. 2A  
 max. 250V AC, 2A, 500VA, non inductive

## Signal input / output

**Signal input:**  
**Start of measurement**

- Floating contact (terminal 24, 25) or
- 24 V DC voltage (terminal 25, 27), current consumption approx. 25mA, observe the polarity.

Duration of starting signal: 0.7 to 5s  
 The contact must be closed or the 24V signal must be present to start.

### Measurement interruption

Used to avoid a measurement in case of filling and to interrupt a running measurement when filling starts. When the terminal 24 und 26 are opened, the sensor weight returns to the upper stop position. If required, remove factory provided wire between terminal 24 and 26 and connect to the filling coupling. The contact must be closed to enable a measurement.

**Signal output:**  
**4-20mA**

Programmable to indicate a level or a volume signal. The output is updated, when the sensor weight touches the surface of the bulk good. It stays until the next measurement is finished.

**Signal output:**  
**Relays**  
 (optional)

Relays can be setted as shown in the following table:

	Relay 1	Relay 2
Factory settings	Failure	Upper stop position
Programmable	Reset pulse	Counting pulse

### Relays set to "Upper stop position / Failure"

Relay 1: indicates a Failure (see also diagnostics "Failure" on page G20)  
 Relay 2: indicates "Upper stop position". The signal allows the user to determine whether the measurement has come to its end. In this case the sensor weight is in its upper stop position, relay contacts are closed.

## Signal overview

	Relay 1	Relay 2
	Failure	Upper stop position
Present		
Not present		

### Relays set to Counting/Reset pulse:

The counting pulse output is used to connect an external digital counter or a PLC with counting input.

#### Reset pulse (terminal 15 and 16, Relay 1):

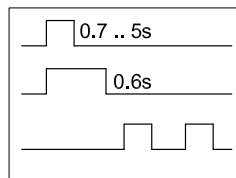
After start of measurement, a reset pulse is given. It is used to reset the connected evaluation device (counter/ PLC, ...).

#### Counting pulse (terminal 17 and 18, Relay 2):

The counting pulse communicates the measured value to the connected evaluation device. During the downward movement of the sensor weight, this pulse is generated according to the following table:

Note: If the used digital counter or PLC requires a common ground for reset and counting pulse, the terminals 15 and 17 can be connected together.

Timing



Start

Reset pulse

Counting pulse

Pulse length 1/3ft (10cm) /

ON= 0.13s, OFF=0.13 ..0.3s

### LED status

LED	Status	
LEDs next to display	Green is on	Power On
	Red is on	Failure
	Red is blinking	Maintenance
	Yellow is on	Internal heater is on
LEDs next to relays terminals	Yellow is on	Relay is energized

## Diagnostics signals

### Failure

Result is a non valid measurement.

Red LED is on. Relay indicates Failure (if selected).

The signal indicates critical situations. Evaluation can help to avoid losing the sensor weight inside the silo.

If Failure is indicated, the unit must be checked on site.

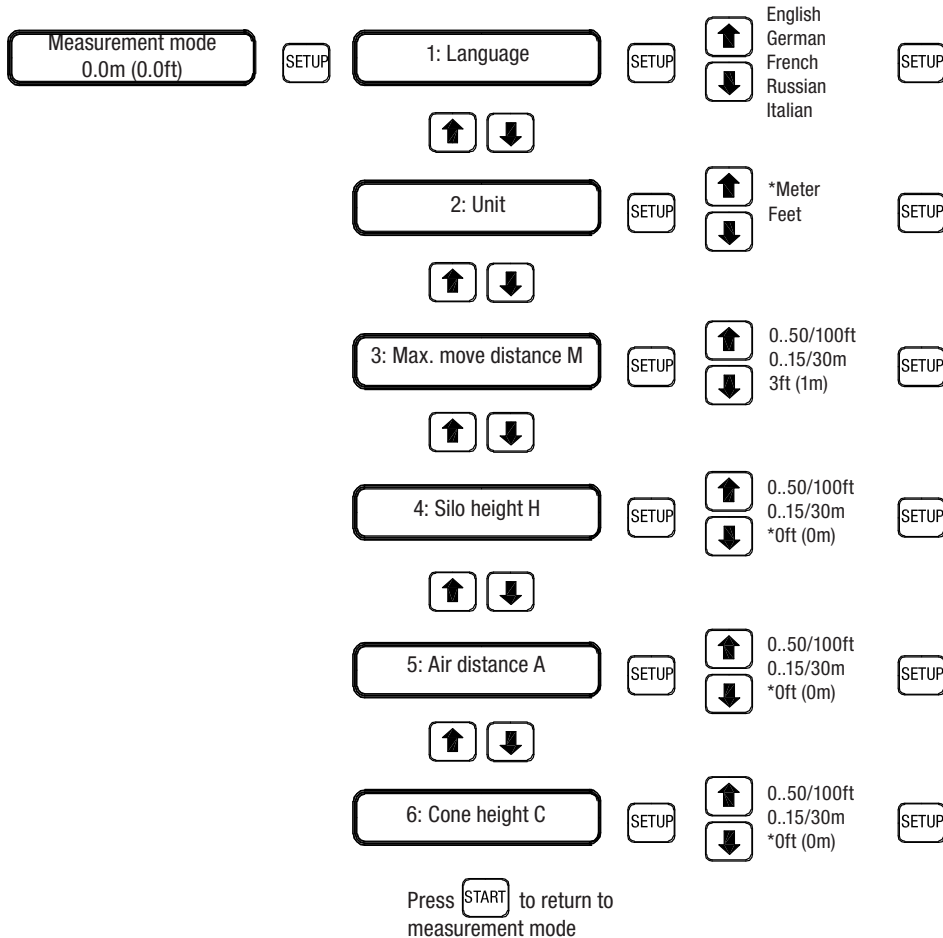
Failure codes description see page G20.

## Programming

### Quickset menu

The Quickset menu is used for fast and easy start-up of the system.

If the unit is working in normal operation (measurement mode), the SETUP button brings up the Quickset menu.



\* Factory-provided

**Max. move distance M** Ensures that the weight does not enter into the silo outlet.

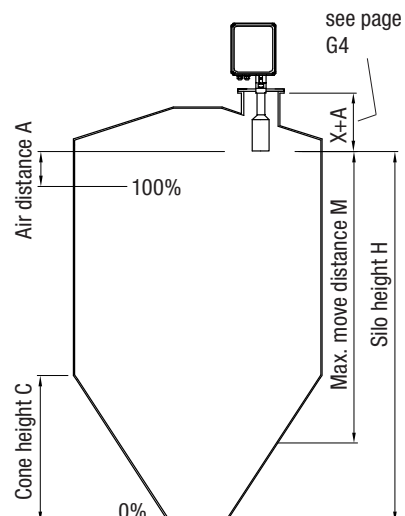
**(1) Silo height H** Definition of 0% level output.  
Note: If the maximum move distance M is smaller than the silo height H, the measured value will always be more than 0%.

**(2) Air distance A** Definition of 100% level output.

**(1) Cone height C** Enables to set the current output as volume.  
C = 0 Current output indicates material level  
C > 0 Current output indicates material volume

(1) These values are not relevant, if the "Counting pulse output" is used.





(2) If needed the 100% level can be set higher than the level of the sensor weight. See advanced menu, item "Inverted air distance".



## Programming




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### Programming buttons

-  Continues to the next item
-  Continues with measurement display after parameter adjustment  
Starts measurement  
Cancels a Failure message (when pressed for 2 sec together with the SETUP button)
-  Increases the value to be adjusted
-  Decreases the value to be adjusted

### Runtime messages

During measurement mode, following runtime indications are given:

-  Upper Stop Position is reached
-  Motor is moving the sensor weight downwards resp. upwards (fast mode)
-  Motor is moving in slow mode (shortly after motor start and before Upper Stop Position is reached)

**Note:**  
Pressing the ARROW DOWN button in measurement mode brings up more service information (not described in this manual)

**Blocked 24-26 open** Measurement interruption is active (terminal 24-26 not connected, see page G12)

### Factory settings

To reset all programmed parameters to factory setting (default values), press the buttons ARROW UP, ARROW DOWN and SETUP together for approx. 10 seconds.

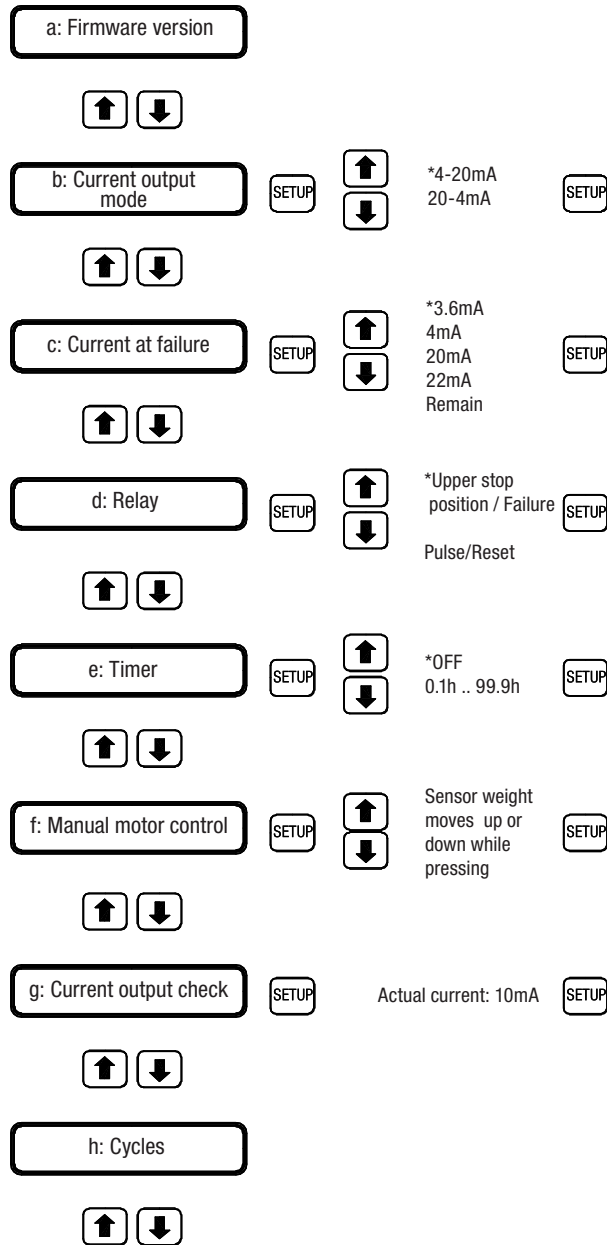
## Programming

### Advanced menu (use only if necessary)

**With the advanced menu it is possible to set the outputs and to display the actual state of the unit.**

Entering the advanced menu:

If the unit is working in normal operation (measurement mode), press both "arrow" buttons together for approx. 2 seconds.

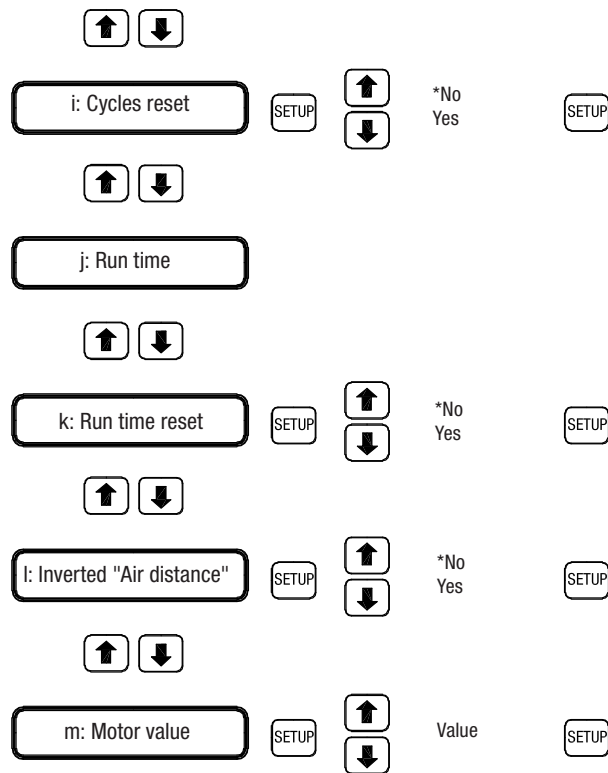


continuation next page



## Programming

continuation

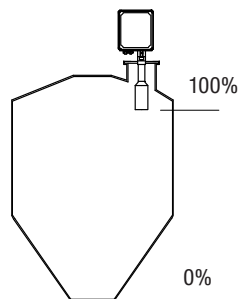


Press **START** to return to measurement mode

\* Factory provided

**Firmware version** States the firmware version of the unit.

### Current output mode



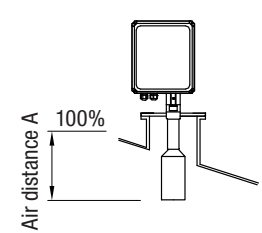
Setting	Current output at level	
	0%	100%
4-20 mA	4 mA	20 mA
20-4 mA	20 mA	4 mA

**Current at failure** In case of failure the current output shows the adjusted value.

**Relay** Selects, if Relays indicate "Upper stop position " and "Failure" or function as a Counting / Reset pulse output  
Details see Signal Overview on page G12/13.

## Programming

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<b>Timer</b>	<p>Automatic start of measurement with the timer function.</p> <p>The timing interval between two measurements can be adjusted between 0.1h (6 minutes) and 99.9 hours. Set to "Off" for no automatic measurements.</p> <p>The timer will be reset after finishing a measurement or after connecting the terminals 24 and 26 (measurement interruption).</p> <p>If the timer is set, a measurement will start immediately after power on.</p> <p>For automatic measurement at a predetermined time of day, an external start signal connected to terminals 24/25/27 is required.</p> <p>To avoid needless wear and tear, the unit should not be started more often than necessary.</p>
<b>Manual motor control</b>	<p>The motor moves the sensor weight upwards while the "ARROW UP" button is being pushed. The motor moves the sensor weight downwards while the "ARROW DOWN" button is being pushed.</p> <p>Note: If the sensor weight is in the upper stop position or touching the bulk material surface or after the max. move distance, the motor is automatically stopped.</p> <p><b>CAUTION:</b> Avoid the sensor weight reaching the outlet position of the silo.</p>
<b>Current output check</b>	<p>Enables to check, if the current output is working proper. The current output is forced to 10mA. This can be evaluated by an external connected multimeter.</p>
<b>Cycles</b>	<p>Indicates how many measurement cycles have been.</p>
<b>Cycles reset</b>	<p>Can be done after a rope/tape change, if the service interval message F16 was not yet present. It sets the internal counter to zero to have the full amount of measurement cycles until the next service interval message will appear.</p> <p>Note: After a F16 message is reset with the "START" button, the rope/tape counter is automatically set to zero.</p>
<b>Run time</b>	<p>Indicates, how long the motor has been running (in hours).</p>
<b>Run time reset</b>	<p>Can be done after a motor change, if the service interval message F17 was not yet present. It sets the internal counter to zero to have the full amount of motor run time until the next service interval message will appear.</p> <p>Note: After a F17 message is reset with the "START" button, the motor counter is automatically set to zero.</p>
<b>Inverted "Air Distance"</b>	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Enables to set the 100% reference of the 4-20mA output to a level which is over the level of the sensor weight.</p> <p>To do this the value must be set to "Yes". The "Air distance A", which is adjusted in the Quickset Menu (see page G14), is now over the level of the sensor weight. The display in the Quickset menu indicates this with a minus as follows: Air distance: - 1.5m .</p> <p>Note: In this case the output will never reach 100%.</p> </div> </div>
<b>Motor value</b>	<p>Internal value only to be used in case of replacement of the motor (see instruction manual of motor replacement).</p>

## Rope / Tape / Motor lifetime

### Rope/Tape lifetime

The expected life time (measurement cycles) for the rope/tape is:

Rope version: approx. 100,000

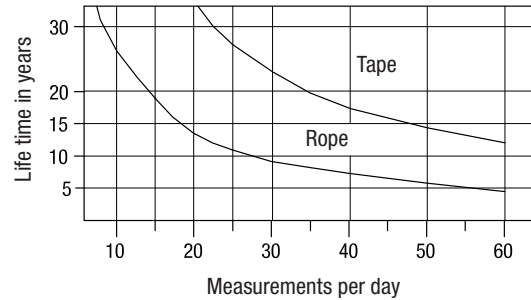
Tape version: approx. 250,000

Note: These values refer to lifetime tests under the following conditions:  
 No excessive material influence. The sensor weight meets an inclined surface, so that an oscillating movement of the sensor weight during upwards movement is caused.

The failure message is displayed at 90% of the expected lifetime to provide some safety. For further information see message F16.

See figure on right hand for the operating time depending on the measurement cycles per day.

For applications with adverse conditions it is recommended to change the rope/tape more frequently.

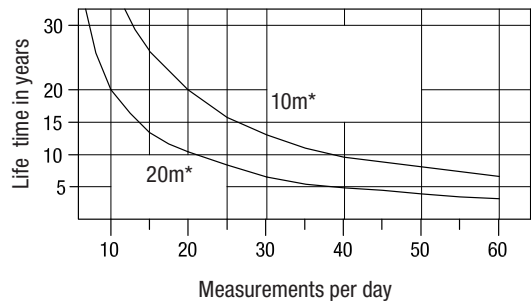


### Motor lifetime

The expected life time (run time) for the motor is approx. 3,500 hours.

The failure message is displayed at 90% of the expected lifetime to consider some safety. For further informations see message F17.

See figure on right hand for the operating time depending on the measurement cycles per day.



\*average measurement distance

## Diagnosics

### Failure:

Result is an invalid measurement.

Red LED is on. Relay 2 indicates Failure (if selected).

The signal indicates critical situations. Evaluating the signal can help to avoid losing the sensor weight inside the silo.

If Failure is indicated, the unit must be checked on site.

Failure code	Description	Indication	Performance of the device	Solution
F10	a) Rope/tape too short or rope jammed in the rope roller. b) Motor or motor-driver-electronic defect.	Motor does not rotate when it is actuated.	If possible, the sensor weight will be moved up to the "Upper stop position".	a) Check rope/tape. b) Check motor connection. Motor or electronic change.
F11	Sensor weight is buried or jammed.	Difference of distance between down and up movement too big.	Motor moves 4 seconds upwards, then waits 10 seconds. After that motor moves shortly downwards and then upwards again. If the sensor weight is still jammed, this cycle is repeated 5 times. After that the cycle goes on with a delaytime of one hour.	Release the sensor weight. Make sure, that the sensor weight can move freely.
F12	Rope / tape broken.	Motor is running but the upper stop position is not reached.	Motor moves upwards. If after a certain time the upper stop position is not reached, the motor stops.	Repair of rope/tape break. Check, if rope/tape maintenance was properly done. Check possibility of buried sensor weight.
F13	Spring broken.	Motor moves downwards and upper stop position is sensed	Motor stop.	Check internal spring.
F15	Not enough current available from DC power supply (DC version only).	Supply voltage drops during function.	Sensor weight is moved to the upper stop position.	Enable enough supply current according to the technical data specification.
F16	Service interval: rope/tape.	The amount of measurement cycles is 90% of the rope/tape lifetime.	The measurement cannot be restarted.	Change rope- or tape roller (do not just cut the rope or tape*).
F17	Service interval: motor.	The actual run time is 90% of the motor lifetime.	The measurement cannot be restarted.	Change motor.

**By pushing the START and SETUP button together for 2 seconds, the failure message shown on the display can be reset.**

\* Cutting of the rope or tape shall not be done. This leads to an inaccurate measurement result, because it changes the diameter of the rope- or tape roller and therefore leads to a different tape length related to the number of turns of the tape roller.

### CAUTION

**Resetting F16 or F17 without changing the rope/tape respective the motor will cause material damage by a broken rope/tape. Before removing the rope/tape roller, remount the unit from the silo to avoid, that the sensor weight can fall into the silo.**

### Maintenance:

Red LED is blinking.

The following message is indicated on the display, but will NOT lead to a failure state and is not indicated by the failure relays or the 4-20mA output:

Code	Description	Performance of the device	Solution
M11	Sensor weight blocked in "upper stop position" or block distance of sensor weight to short	The unit tries to start 5 times. If the sensor weight is not released during this time, the message is shown. If after a new measurement start the sensor weight is released, the message will automatically disappear.	Release sensor weight. Ensure, that the min. moving distance (block distance) is > 7.9" (200mm)