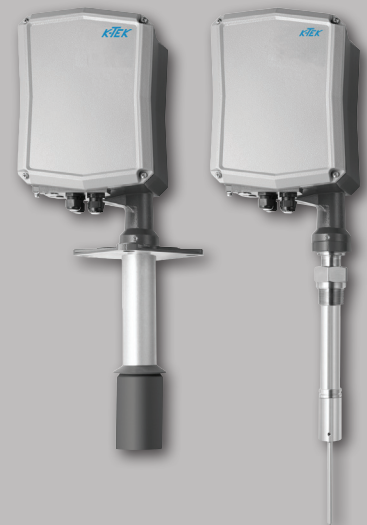


SoliTrak

Electro-Mechanical On Demand Level Measurement (Plumb Bob Device)



For the latest version of this manual, visit kteksolidslevel.com.

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1.0 Introduction

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

Applications

- Powder, granulate, small or coarse bulk goods
- Interface measurement (solids in water)

Applicable for industries such as

- Chemistry
- Food
- Cement
- Mining
- 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
- Very accurate measurement

Service

- Simple installation and commissioning
- Measurement principle easy to understand
- Rope, tape and (optional) motor with increased service life
- Low maintenance

Approvals

- Approval for use in Hazardous Locations ATEX II 1/2 D (zone 20/21) and FM Class. II, III Div.1 Gr. E-G

Mechanic

- Measurement range upto 133 ft/40 m
- 1 1/2" process connection possible
- Different sensor weights, suitable for every application
- Internal tape cleaner for difficult materials
- Window in lid and external start button (optional)
- Robust cast housing, ingress protection IP66

Electronic

- Micro processor controlled measurement
- Remote Box for external programming, display of level and diagnose, start of measurement of up to 10 SoliTrak units
- Comprehensive Diagnose possibilities
- Output 0/4-20mA / Modbus / Profibus DP / counting pulses
- Programmable relais (can be used as level limit switch outputs)
- Measurement start with external signal or integrated timer

Function

The SoliTrak is mounted on the top of the silo. A sensor weight is driven 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.

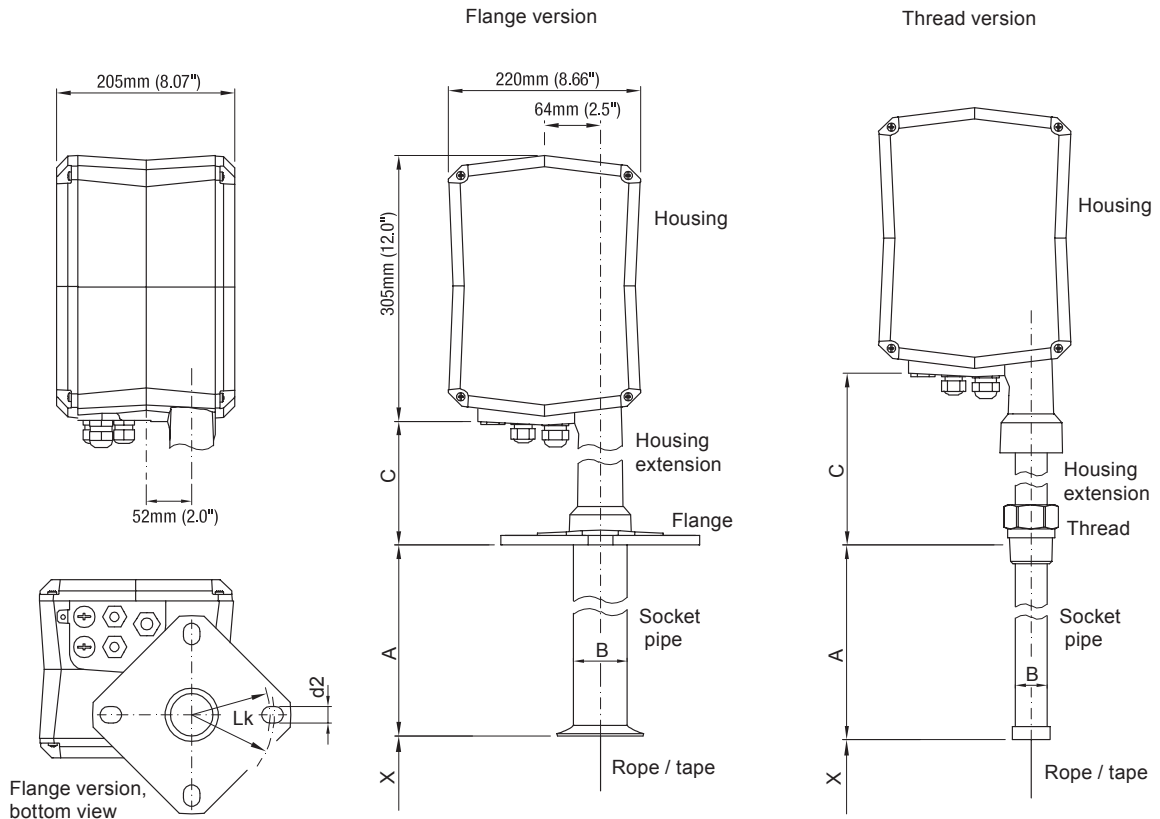
Diagnostics

Comprehensive diagnostics possibilities are present:

- 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 running time.
- Internal control of motor, motor driver electronic and smooth movement of rope / tape rollers.
- Diagnostics is in accordance with NAMUR recommendation NE107.

2.0 Dimensions

2.1 Basic type



Dimensions

X = Length to bottom of sensor weight
(in upper stop position): see next page

A = Length of socket pipe
7.9 in / 200 mm
Optional 19.7 in / 500 mm; 39.4 in / 1000 mm

B = Diameter of socket pipe

Rope version with Flange DN100 / 4"	\varnothing 2.36 in / 60 mm
All other versions	\varnothing 1.57 in / 40 mm

C = Housing extension

Flange version	80°C / 150°C	3.74 in / 95 mm
	250°C	13.4 in / 340 mm
Thread version	80°C / 150°C	6.3 in / 160 mm
	250°C	13.4 in / 340 mm

Rope	\varnothing 0.49 in / 1.25 mm
Tape	0.47 x 0.008 in / 12 x 0.2 mm

Flanges	
fitting to: DN100 PN16 / 4" 150lbs	Lk = \varnothing 90 .. 95.3mm (3.54 .. 3.75 in) slot d2 = \varnothing 19mm (0.75 in)
fitting to: 2" / 3" 150lbs	Lk = \varnothing 60.4 .. 76.2 mm (2.38 .. 3.0 in) slot d2 = \varnothing 19 mm (0.75 in)

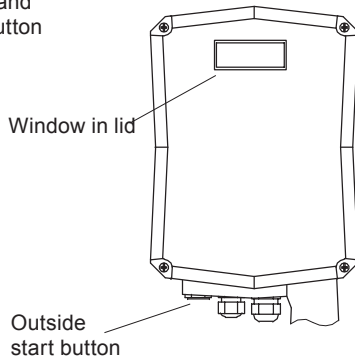
Materials	
Housing outside	Aluminium, powder coated
Housing inside	Aluminium
Housing extension	Aluminium, powder coated or 1.4305 (303)
Flange	80°C / 150°C: Aluminium, powder coated 250°C: 1.4305 (303)
Thread	1.4301 (304)
Socket pipe	Flange version 80°C / 150°C: Aluminium All other versions: 1.4301 (304)
Rope	1.4301 (304)
Tape	1.4310 (301)

With option "Increased corrosion resistance": All metal parts in contact with the process are coated. The rope is plastic coated with PA. The internal bearings are made of stainless steel.

2.2 Options and Accesories

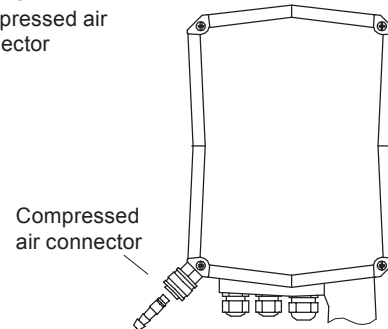
Pos. 25

Window in lid and
outside start button



Pos. 28

Compressed air
connector

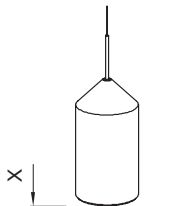


2.3 Sensor weights

2.3.1 Solids measurement: Rope version

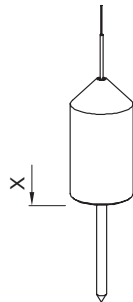
All weights ca. 1,0kg (2.2lbs)

PVC without pin



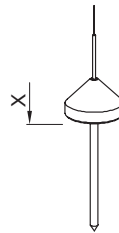
Ø81mm (3,2")
X = 137mm (5.4")
Material: PVC

PVC with pin



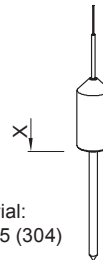
Ø81mm (3,2")
X = 137mm (5.4")
Pin: 130mm (5.1")
Material: PVC (pin POM)

Stainless steel



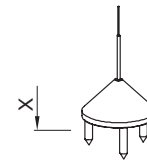
Version with
Flange DN100
/ 4"
Ø75mm (3.0")
X = 25mm (1.0")
Pin: 130mm (5.1")

Material:
1.4305 (304)



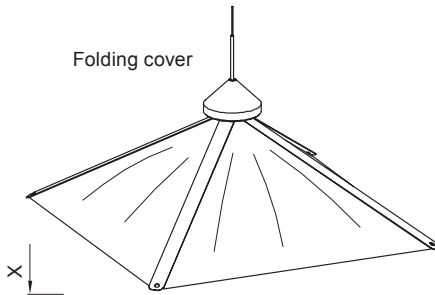
All other versions
Ø42mm (Ø 1.65")
X = 81mm (3.19")
Pin: 130mm (5.1")

Claw



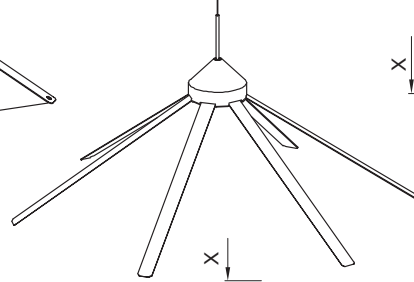
Ø95 (3.7")
X = 71mm (2.80")
Material: 1.4305
(304)

Folding cover



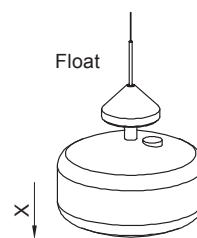
380x380mm (15x15")
X = 150mm (5.9")
Material: 1.4310 (301)
PA canvas

Spider



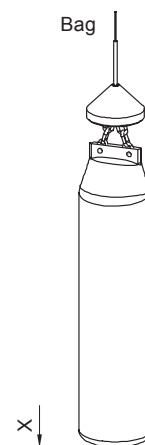
Ø600mm (23.6")
X = 160mm (6.3")
Material: 1.4301 (304) /
1.4310 (301)

Float



Ø190mm (7.5")
X = 175mm (6.9")
Material: Float PP,
Cone: 1.4305
(304)

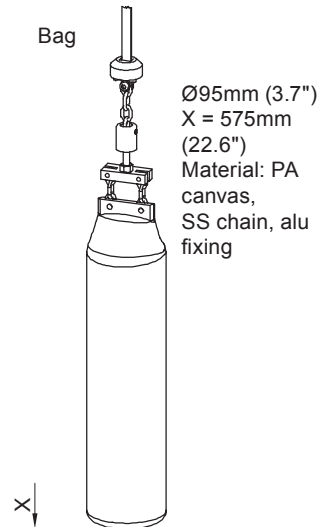
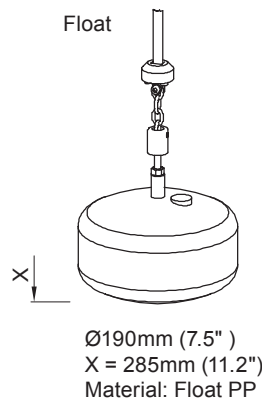
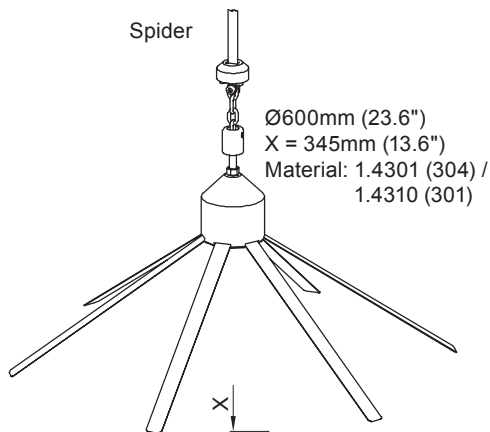
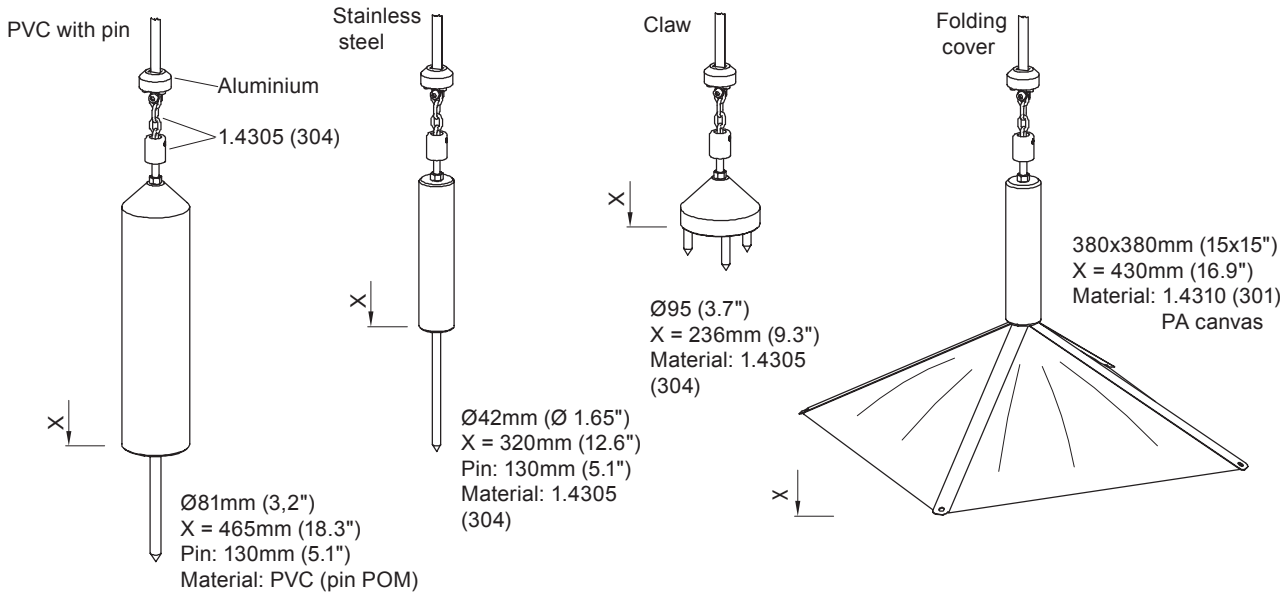
Bag



Ø95mm (3.7")
X = 460mm (18.1")
Material: PA canvas,
SS chain, alu cone

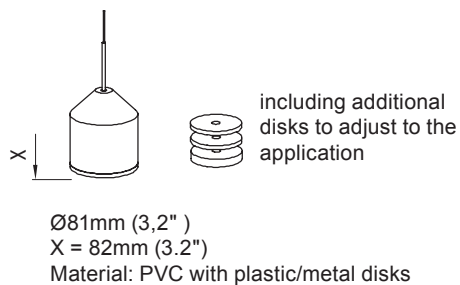
2.3.2 Solids measurement: Tape version

All weights ca. 2.1kg (4.6lbs)



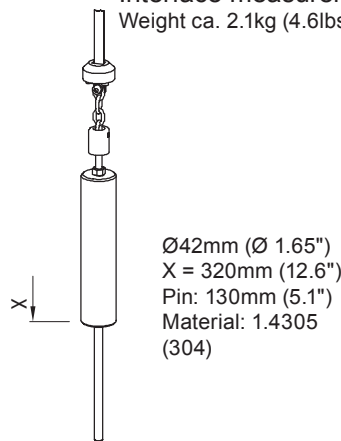
Interface measurement: Rope version

Weight ca. 1,0kg (2,2lbs)



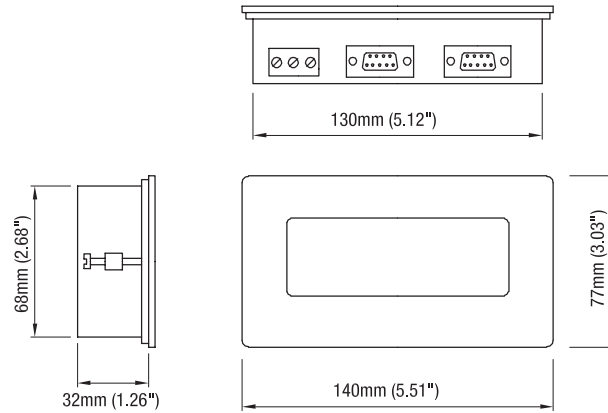
Interface measurement: Tape version

Weight ca. 2,1kg (4,6lbs)

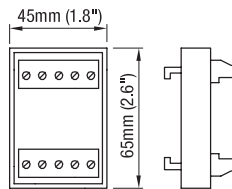


2.4 SLT Remote Box

SLT Panel mounting

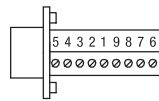


Biasing network

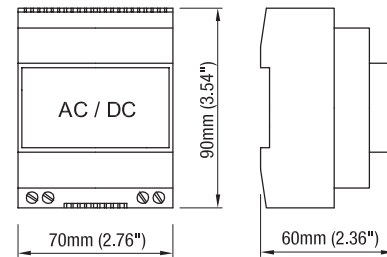


Mounting: DIN rail 35

Terminal plug

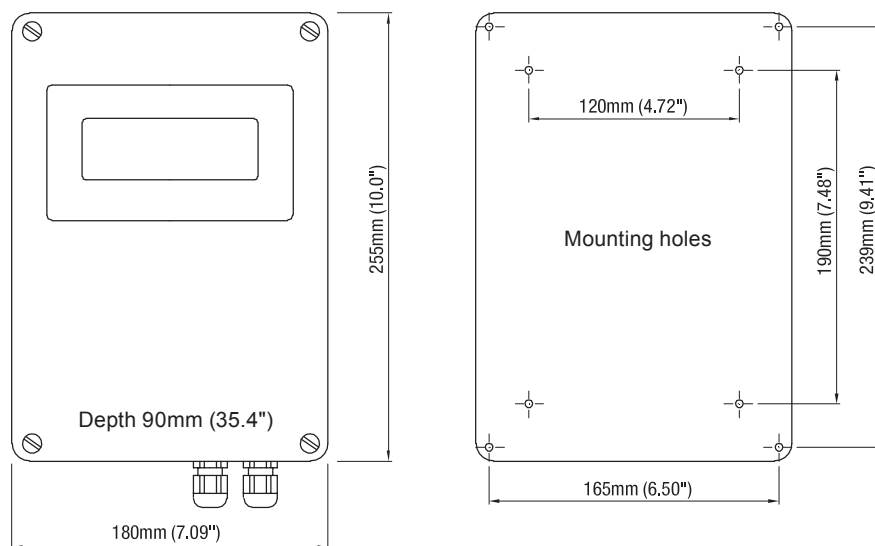


AC/DC converter



Mounting: DIN rail 35

SLT Wall mounting



3.0 Technical data

3.1 Electrical data

Power supply	AC version 98 .. 253V 50-60Hz DC version 20 .. 28V (voltages incl. 10% of EN 61010)		
Installed load	AC version: 150 VA (including internal heater (80W)) DC version: 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.		
Signal output: 0/4-20mA	Max. 500 Ohms (active, isolated) Linearity +/- 0,1mA		
Signal output: Relay	4x Relay SPST: max. 250V AC, 2A, 500VA non inductive		
Signal output: Electronic counting pulse	Optocoupler max. 30V DC, max. 25mA		
Communication: Modbus RTU	Physical layer: RS 485 and Ground, isolated Mode: RTU, Type: Slave Device number range: 1 - 247 (selectable in menu), Baudrate: 1200 to 57600 Baud, Data bits: 8, Stop Bits: 1 Parity: None Multi-drop configuration possible. Factory setting of address is 100. Each unit which is connected to the network must be set to an individual address. Supported commands Reading: All diagnostics and parameters using command 03 _{HEX} : Read Holding Register Writing: All parameters using command 06 _{HEX} : Write Single Register (not supported is command 10 _{HEX} : Write Multiple Register).		
Communication: Profibus DP	Physical layer: RS 485, isolated Type: Slave Device number range: 0 - 126 (selectable in menu), Baudrate: 9.6 kbps to 12 Mbps Available communication by GSD file, Read only (Sensor weight bottom to material (in mm))		
Accuracy of measurement	Output	Setting	Accuracy
	Counting pulse	10cm (1/6ft) / pulse	1 pulse
		5cm (1/3 ft) / pulse	1 pulse
		2,5cm (1/10ft) / pulse	2 pulses
		1cm (1/20ft) / pulse	4 pulses
	0/4-20mA		1% of max. range
	Modbus RTU / Profibus		0.5% of max. range
Display	LCD display: 2 line x 16 digit		
Indication light	Status by build in LED: Power On, Relais, Maintenance and Failure		

Memory	Non-volatile (no backup battery required) > 10 years data retention
Connection terminals	0.14 .. 2.5mm ² (AWG 26 .. 14)
Cable entry	According to selection: Screwed cable gland: 2x M20x1.5 and 1x M25x1.5 Blindplug: 2x M20x1.5 or Conduit ANSI B1.20.1: 1x NPT 3/4"+ 2x NPT 1/2" Blindplug: 2x NPT 1/2"
Extension cables for Remote Box SoliTrak and Modbus	Specifications see in chapter "Electrical installation" Suggested cable types see in chapter "Accessories"
Extension cables for Profibus DP	Use common recommended Profibus cables
Isolation	Power supply to all other outputs / inputs: AC version 2210 Vrms DC version: 1000 VDC Relay to relay: 2210 Vrms
Protection class	I

3.2 Mechanical data

Ingress protection	IP 66, Type 4
Process connection	Threads: R 1 1/2" DIN 2999 tapered, NPT 1 1/2" or 3" ANSI B1.20.1 tapered Flanges: DN100 PN16 EN1092-1 (unit fits to this flange) 2" or 3" or 4" 150lbs ANSI B16.5 (unit fits to this flange)
Colour	Housing, Flange RAL 5010 (gentian blue) Lid RAL 9006 (aluminium silver)
Material	See detail specifications on page G4 - G6
Measuring range	Rope version max. 30m (100ft) Tape version max. 40m (133ft)
Measuring speed	Sensor weight speed in average: Standard version: ca. 0.25m/s (0.8ft/sec) Version with brushless motor: ca. 0.33m/s (1.0ft/sec)
Weight	Rope version with flange: ca. 11kg (24.2lbs) with thread: ca. 12kg (26.4lbs) Tape version with flange: ca. 12kg (26.4lbs) with thread: ca. 13kg (28.6lbs)
Deviation of vertical mounting	max. 2°
Compressed air connector (Option)	Quick coupling incl. opposite part, for hose diameter 9mm (0.35"), female at housing Max. operating pressure 0.2bar (2.9psi)

3.3 Operating Conditions

Process overpressure	-0.3 ..+0.3bar (-4.4 ..+4.4psi) -0.5 .. + 1.7 bar (-7.3 .. +25psi) optional for CE -0.5 .. + 1.1 bar (-7.3 .. +16psi) optional for FM		
Process temperature	-40°C ..+80 /150 / 250°C (-40 ..+176 / 302 / 482°F)		
Ambient temperature	-20°C .. +60°C (-4 .. +140°F) -40°C .. +60°C (-40 .. +140°F) -40°C .. +60°C (-40 .. +140°F) max. +40°C (104°F)	CE, FM General Purpose with internal heater ATEX, FM Class II on request possible Version with Process temp. 150°C (302°F)	
Min. powder density	see "Sensor weight guide" on next page		
Minimum time between measuring starts	measuring height 5m (16ft)-> 3min measuring height 10m (33ft) -> 6min measuring height 20m (66ft) -> 12min measuring height 30m (98ft) -> 18min measuring height 40m (131ft) -> 24min		
Rope/tape operating time	see page G38		
Max. permitted tractive force	Tape version:	with brushless motor: standard motor:	ca. 3000N ca. 800N
	Rope version:	with brushless motor: standard motor: with increased corrosion resistance:	ca. 1000N ca. 800N ca. 700N
Relative humidity	0-100%, suitable for outdoor		
Altitude	max. 2000m (6.562ft)		

3.4 Approvals

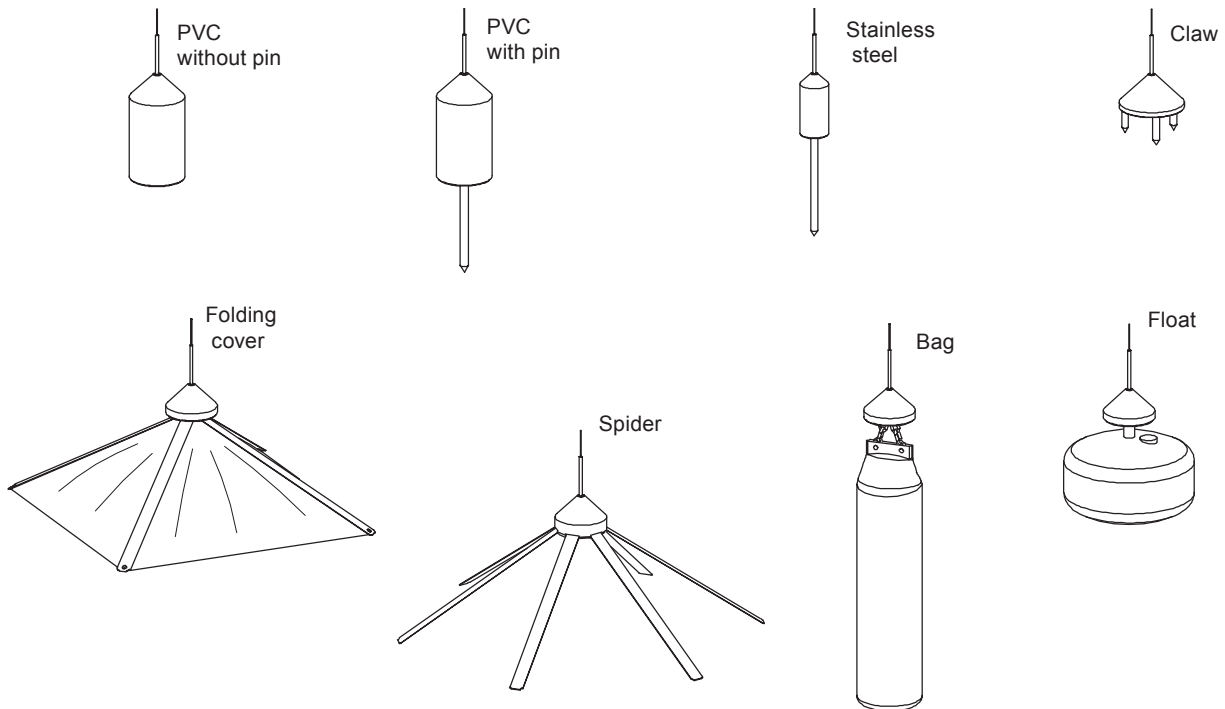
Hazardous Locations*	ATEX II 1/2 D (zone 20/21) FM Class. II, III Div.1 Gr. E-G		
General purpose *	CE	EN 61010-1	
	FM	General purpose	
EMC	EN 61326 -A1 (industrial standard)		

* Depending on selected version in pricelist

3.5 Sensor weight guide (solids measurement)

Sensor weight	Application				Note	Fits through mounting hole				
	* Material density g/l (lb/ft ³)	Material consistence	Angle of repose	Max. process temp.		Thread		Flange		
						1 1/2"	3"	2"	3"	DN100 / 4"
PVC without pin	>300 (18)	granulate	flat	80°C (176°F)	Standard weight					•
PVC with pin	>300 (18)	granulate, powder	steep	80°C (176°F)	The pin penetrates into the material and avoids slipping or tilting of the sensor weight on the steep bulk surface.					•
Stainl. steel	>300 (18)	granulate, powder	flat, steep	250°C (482°F)	The pin penetrates into the material and avoids slipping or tilting of the sensor weight on the steep bulk surface.	•	•	•	•	•
Claw	>200 (12)	coarse (e.g. stones)	steep	250°C (482°F)	Avoids slipping or tilting on the steep bulk surface.					•
Folding cover	>20 (1.2)	light powder	flat, steep	80°C (176°F)	Big surface prevents the sensor weight from sinking into the material.	•	•	•	•	•
Spider	>40 (1.4)	light powder	flat, steep	250°C (482°F)	Big surface prevents the sensor weight from sinking into the material.					•
Bag	>300 (18)	granulate, powder	flat	80°C (176°F)	Prevents damage of the conveying screw. To be filled with bulk material.					•
Float	-	liquids only	-	80°C (176°F)	To be filled with material.					

* The above mentioned data is a guideline and is valid for material which has settled after filling. During the filling the bulk density can change (e. g. for fluidised material).



4.0 Options / Accessories

Window in lid and external start button

Enables to see the display through the closed lid and to start a measurement without opening the lid.

Drawing see page G5

Material of the window: break-proof glass.

4.1 Accessories

SoliTrak Remote box (Panel mounting)

Connecting up to 10 units with Modbus RTU network.

Features:

- Programming of the SoliTrak units
- Display of level
- Start of measurement
- Display of diagnostics information

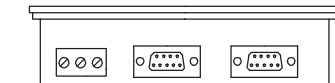
Technical data:

- SoliTrak works as a Modbus master
- Touchpanel
- Power supply: 24V DC $\pm 10\%$ 10W or 85 .. 264V $\pm 0\%$ 50-60Hz 10VA
- Ambient temperature: $-0 \dots +50^{\circ}\text{C}$ ($-32 \dots +122^{\circ}\text{F}$)
- Ingress protection: IP65
- Installation only in Non-Hazardous areas permitted

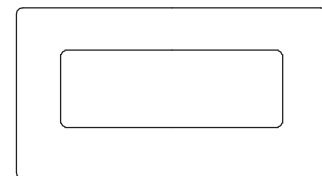
Included parts:

For easy installation and proper functioning of the Modbus network

- Biasing network (with Terminal resistor): Stabilizer for Modbus communication. Supports the needed biasing voltages to ensure a proper function in a network with long installed cables. Termination resistor is needed for the beginning of the Modbus network.
- Terminal Plug Supplies screwing terminals for connection between SoliTrak panel and Biasing network
- AC/DC converter Used, if AC power supply is selected

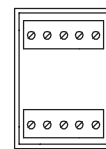


SoliTrak Panel

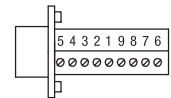


Biasing network

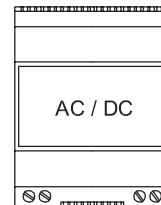
Terminal Plug



DIN rail 35 mounting



AC/DC converter



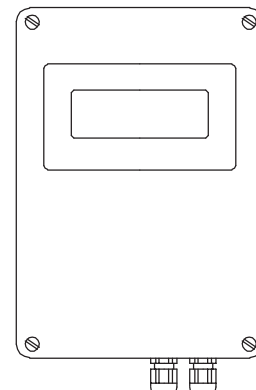
DIN rail 35 mounting

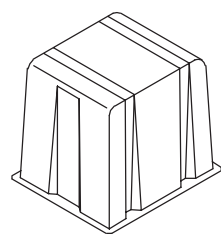
SoliTrak Remote Box (Wall mounting)

Implementation of SoliTrak panel in a wall mounted enclosure.

Material: PC (fibre glas reinforced)

Biasing network (with Termination resistor) implemented.
AC/DC converter (if AC power supply is selected) implemented.



Extension cables	<ul style="list-style-type: none">• For connecting the Remote Box SoliTrak• For wiring a Modbus network• Notes for choosing the right cable see chapter "Electrical Installation"• It is generally recommended to protect PVC signal cables from UV influence by installing them in a pipe or hose. <p>Shielded cable Functionality upto 50m Cross section 2x 0,34mm² (AWG22), common shield Capacitance 140nF/km (between wires) / 150nF/km (wire to shield) -30°C (-22°F) to 70°C (158°F), PVC (LiYCY)</p> <p>Twisted pair cable Functionality upto 1000m Twisted pair instrument cable, common shield Cross section 2x 0,34mm² (AWG22) Impedance 120 Ohms Capacitance 40nF/km -40°C (-40°F) to 75°C (167°F), PVC</p> <p>Protection hose for installation of extension cables in ATEX Zone 21 available</p>	
Weather protection cover	<p>If the unit is used outdoors, the use of the weather protection cover is recommended. It protects the device from all atmospheric influences such as</p> <ul style="list-style-type: none">• rain water• condensation water• excessively high temperatures• excessively low temperatures in winter <p>Material: PE, weather and temperature stable</p> <p>For use in Hazardous Locations only permitted for Zone 22 or Division 2.</p>	
Mounting set	Sealings, screws and washers for fixing the unit on a flange.	

5.0 Mounting

5.1 General Safety Instructions

Process pressure	Improper installation may result in loss of process pressure.
Chemical resistance against the medium	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.
Mounting location	The right mounting place is significant for a proper function. Observe mounting instructions.
Vibrations	Avoid mounting in applications with strong vibration. Use rubber mounts for absorption in case of light vibrations.

5.2 Additional Safety Instructions for Hazardous Locations

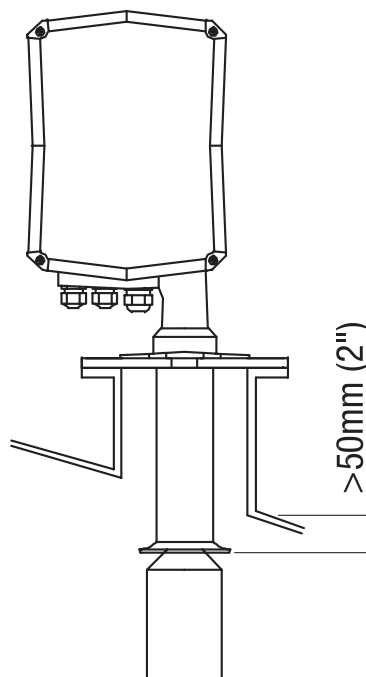
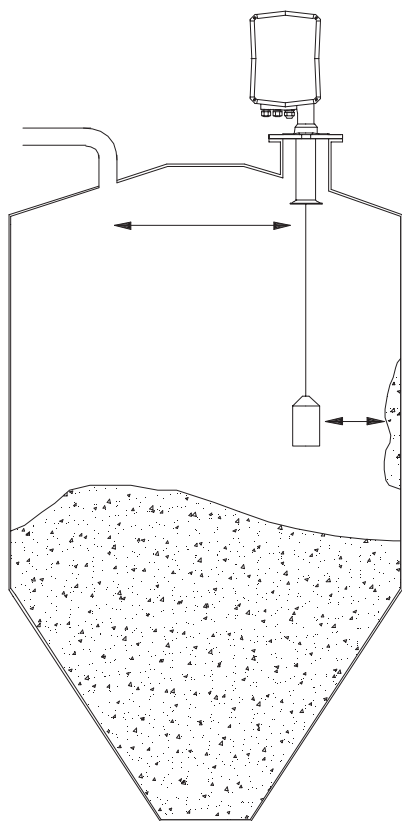
Installation regulations	For devices to be used in Hazardous Locations the respective valid installation regulations must be observed.
Sparks	The installation has to be done in a way, that mechanical friction or impact does not cause sparks between the aluminium enclosure and steel.

5.3 Mounting Instructions

- Mounting position
- The unit is mounted vertically on the silo. Max. deviation is 2°.
 - There must be at least 200mm (7.87") 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 - G6).

- 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.

- The socket pipe of the unit must protrude at least 50mm (2") into the silo. A version with longer socket pipe is available.



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.

Sensor weight "Bag" and "Float"

- The weights are filled with plastic granulate or sand. They shall be filled on site with bulk material or liquid, which is not critical if mixed with the material stored in the silo. Consider ageing of the material.
- When filling, observe the total weight of the sensor: rope version 1.0kg (2.2lbs), tape version 2.1kg (4.6lbs)

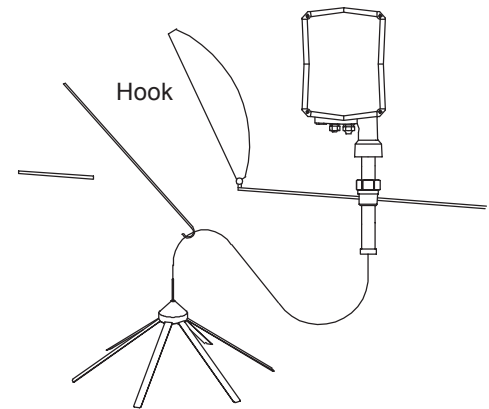
Sealing

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

Sensor weight which does not fit through the mounting hole

The sensor weight must be removed before placing the unit on the silo. An inlet close to the fixing location and a hook is needed.

See installation manual for more details.



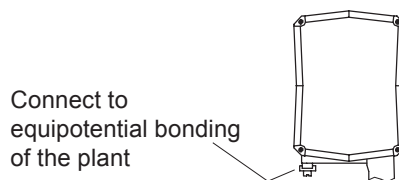
6.0 Electrical installation

6.1 General Safety Instructions

Handling	In case of improper handling or handling malpractice, the electric safety of the device cannot be guaranteed.
Installation regulations	The local regulations or VDE 0100 (Regulations of German Electrotechnical Engineers) must be observed.
Fuse	Use a fuse as stated in the connection diagrams.
RCCB protection	In case of a fault, the supply voltage must be automatically switched off by a RCCB protection switch to protect against indirect contact with dangerous voltages.
Power supply switch	A voltage disconnection switch must be provided near the device.
Wiring diagram	The electrical connections are made in accordance with the wiring diagram.
Supply voltage	Compare the supply voltage applied with the specifications given on the name plate before switching the device on.
Cable gland	Make sure that the screwed cable gland safely seals the cable and that it is tight (danger of water intrusion). Cable glands that are not used have to be sealed with a blanking element.
Conduit system	In case of using a conduit system (with NPT thread) instead of a cable gland 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. Not used inlets must be closed tight with a metal blanking element.
Field wiring cables	All field wirings must have insulation suitable for at least 250V AC. The temperature rating must be at least 80°C (176°F).
Relay protection	Provide protection for relay contacts to protect the device against inductive load surges.
Protection against static charging	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.

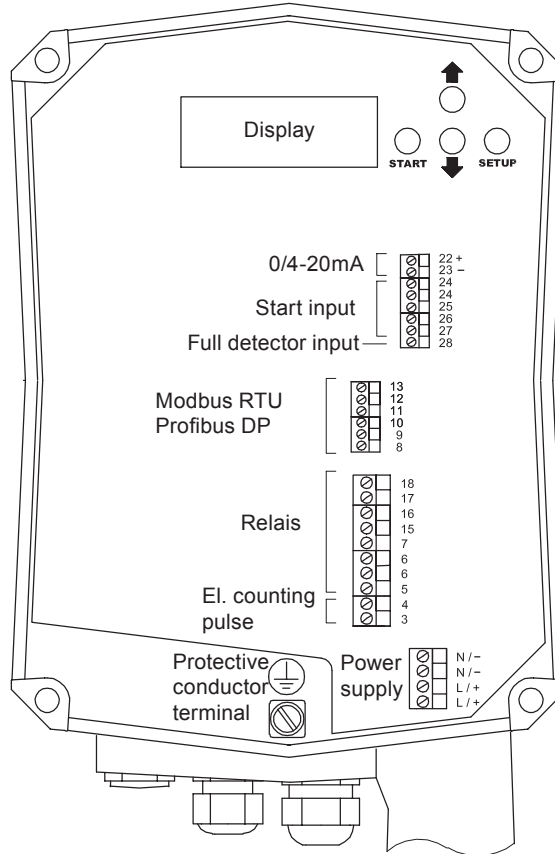
6.2 Additional Safety Instructions for Hazardous Locations

External equipotential bonding terminal



Field wiring	A strain relief must be provided for the field wiring cables, if the device is installed with the factory provided cable glands.
Cable glands for ATEX Hazardous Locations	The used entry devices 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.
Conduit system for ATEX and 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.
Comissioning / opening the lid	Comissioning only, when there are no dust deposits or swirls present.

6.3 Terminal location

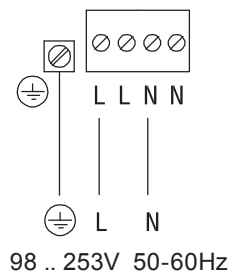


6.4 SoliTrak - Power supply and Signal input /output

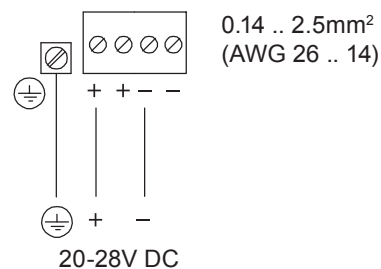
Power supply

AC version

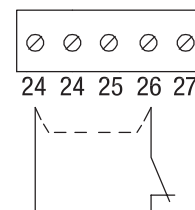
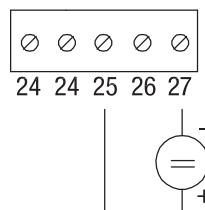
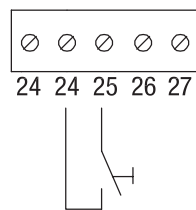
DC version



AC or DC supply depending on ordered version



Signal input:
Start of measurement



0.14 .. 2.5mm²
(AWG 26 .. 14)

Start contact

Start +24V

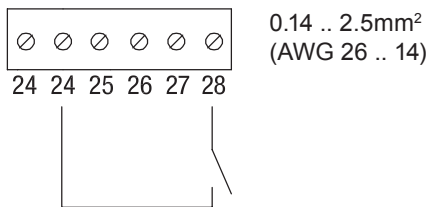
alternative

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

Signal description:
See page G22

7.0 Electrical installation

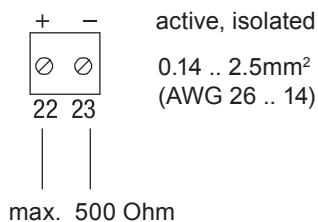
Signal input:
Full detector



0.14 .. 2.5mm²
(AWG 26 .. 14)

Signal
description:
See page
G22

Signal output:
0/4-20mA

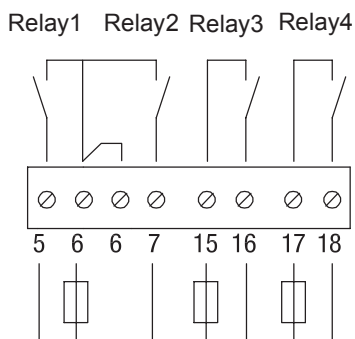


active, isolated
0.14 .. 2.5mm²
(AWG 26 .. 14)

max. 500 Ohm

Signal
description:
See page G22

Signal output:
Relay



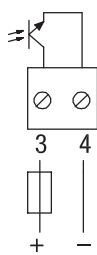
0.14 .. 2.5mm²
(AWG 26 .. 14)

Fuse: max. 2A

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

Signal
description:
See page G22

Signal output:
Electronic counting pulse



Optocoupler
0.14 .. 2.5mm²
(AWG 26 .. 14)

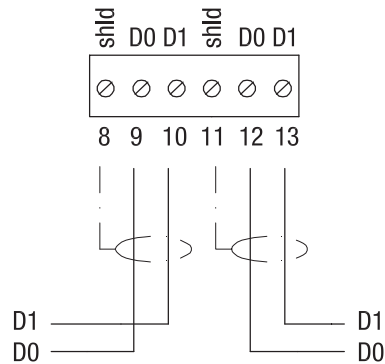
Fuse: max. 63mA

max. 30V DC, max. 25mA

Note:
Reset pulse is done with Relay 2

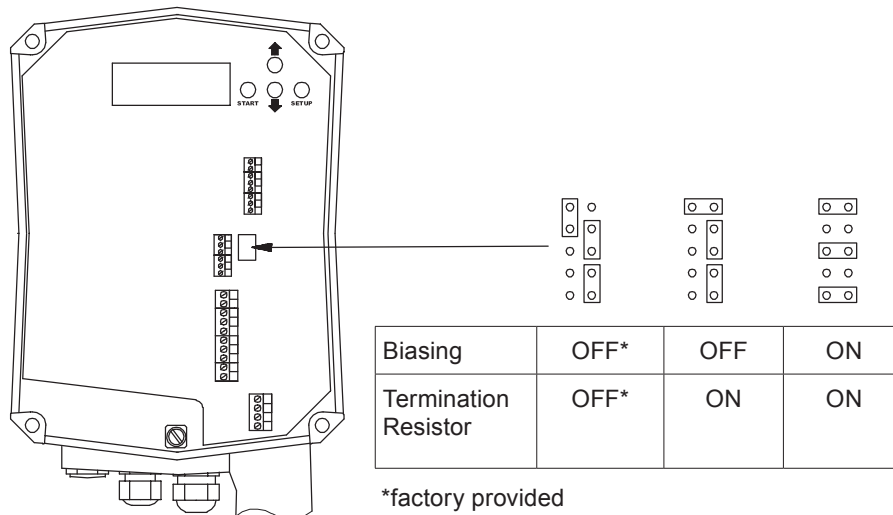
Signal
description:
See page G23

7.1 SoliTrak - Modbus network

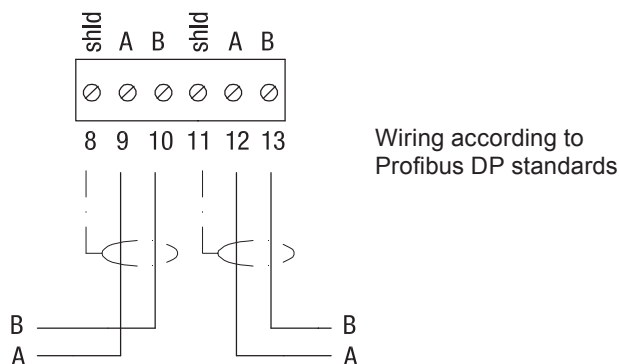


7.2 Setting Biasing and Termination Resistor

For use of SoliTrak units in an external Modbus network, it is possible to set Biasing and Termination Resistor on each unit as required.

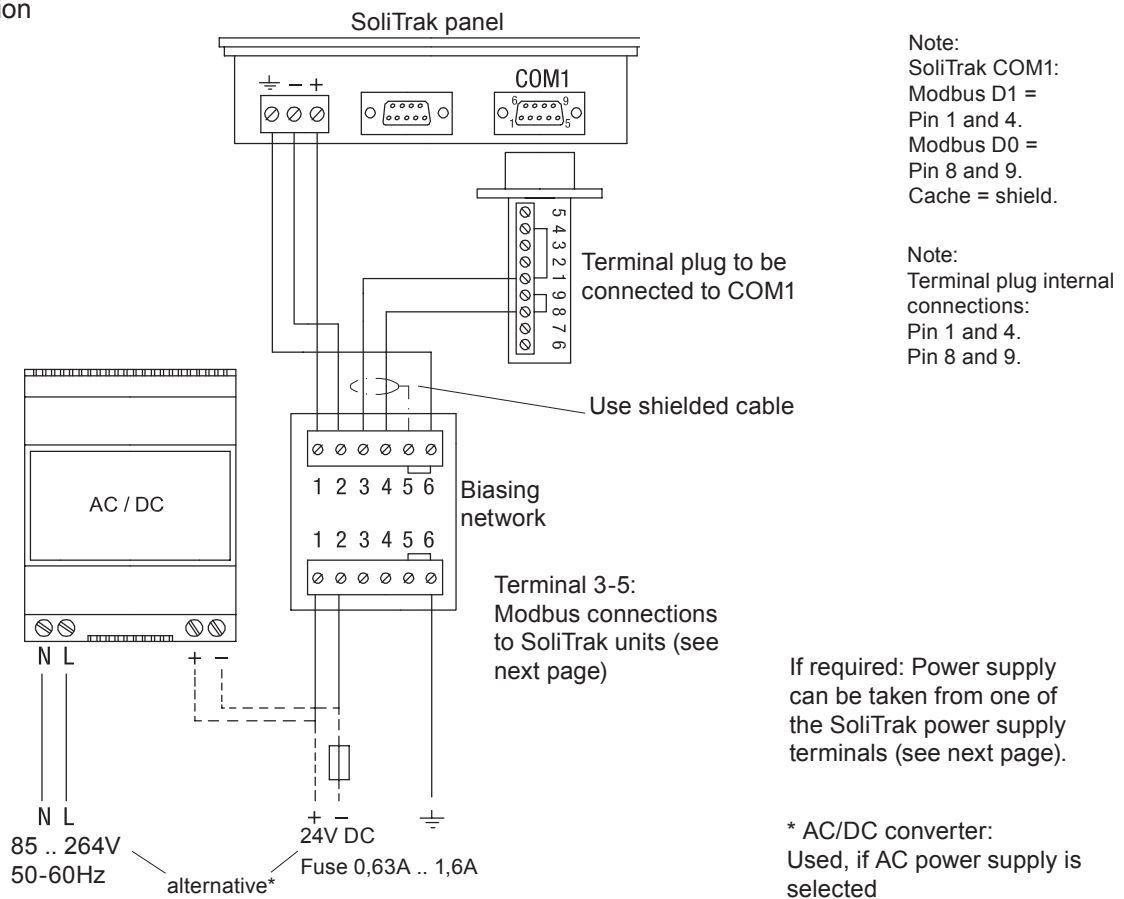


7.3 SoliTrak - Profibus DP network

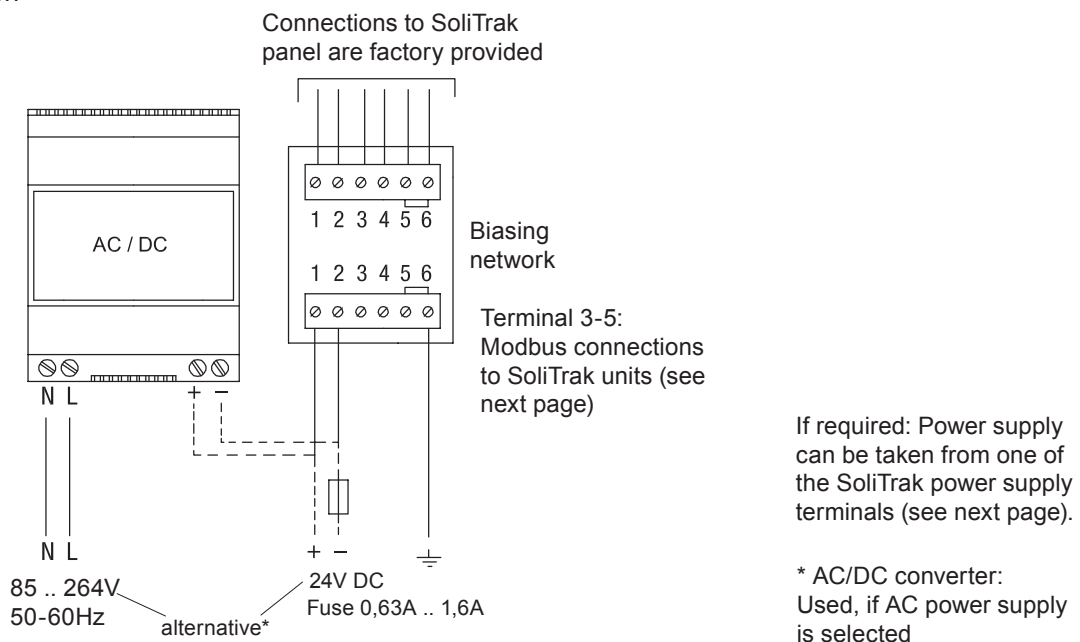


7.4 Remote Box SoliTrak - Internal wiring and power supply

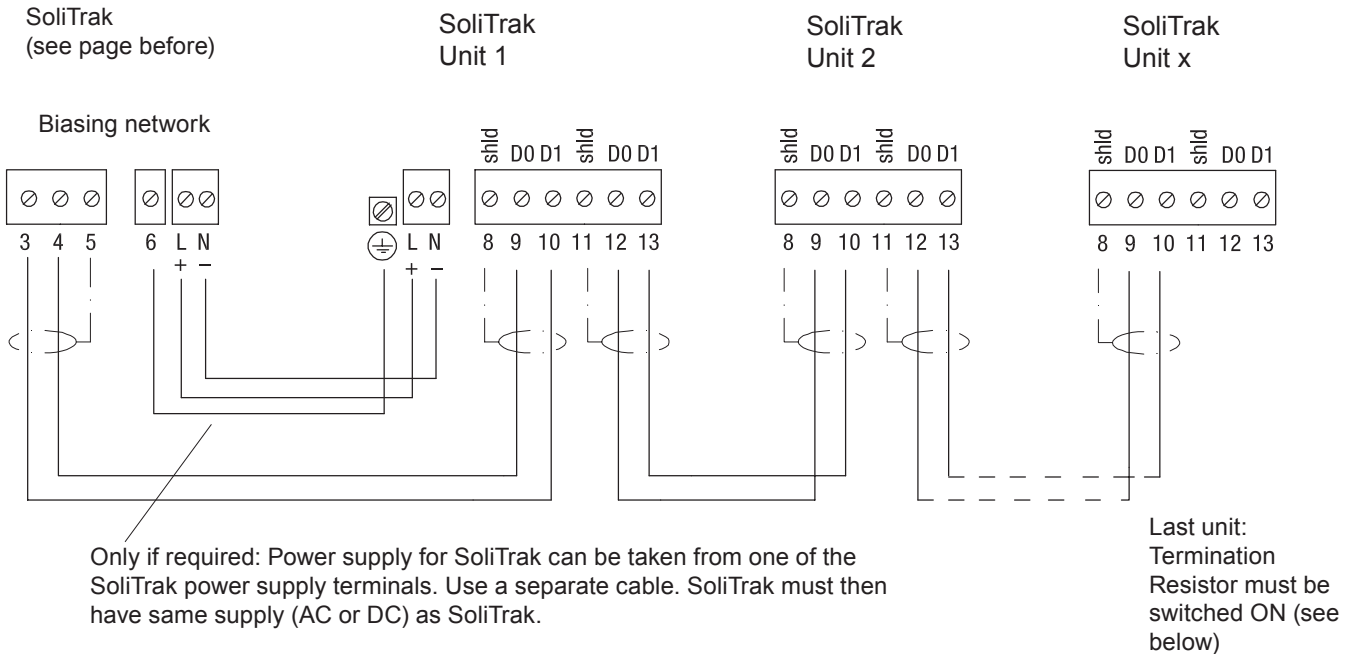
Panel mounting version



Wall mounting version



7.5 Remote Box SoliTrak - Connecting to SoliTrak



Recommended Modbus cables:

Cable length <50m (164 ft):

Shielded cable (specifications see page G13)

Cable length >50m (164ft) - 1000m (3270ft): Twisted pair cable (specifications see page G13)

Notes:

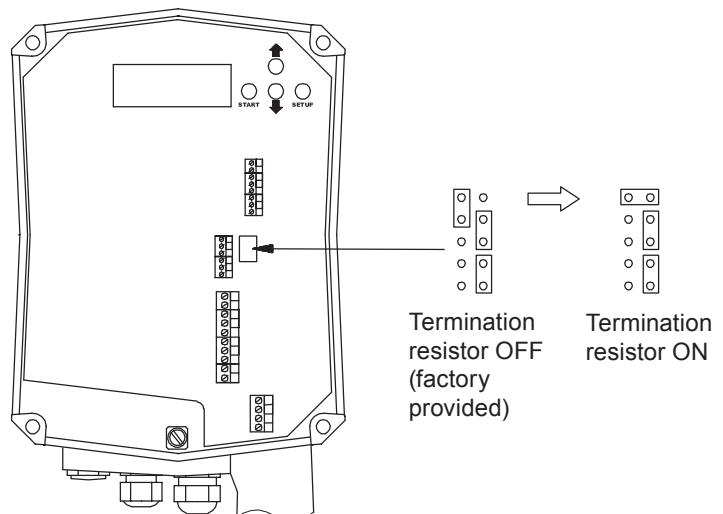
- Installation of SoliTrak only in Non-Hazardous areas permitted
- Max. length of network: 1000m (3270ft)
- Max. 10 units SoliTrak possible
- Additional use of other signal input and output should be wired in a separate cable.
- D0, D1 = Modbus lines

7.6 Setting the Termination Resistor

A termination resistor must be present at both ends of the modbus network (ca. 150 Ohms between lines D0 and D1).

The biasing network of the SoliTrak implements a termination resistor at the beginning of the network.

The termination resistor of the last SoliTrak in a network must be switched on (jumper setting, see drawing).



8.0 Signal overview

8.1 Signal input / output

- Signal input: • Floating contact (terminal 24, 25) or
 Start of measurement • 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 input: Enables to implement a full detector signal in the Modbus or Profibus.
 Full detector When the signal is present (terminal 24-28 closed) the yellow LED next to the display in on.

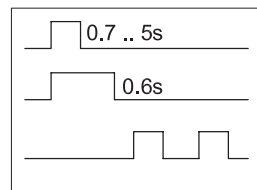
Signal output: Programmable to indicate a level or a volume signal. The output is updated, when the sensor
 0/4-20mA weight touches the surface of the bulk good. It stays until the next measurement is done.

Signal output: Relais can be setted as shown in the following table:

	Relay 1	Relay 2	Relay 3	Relay 4
Factory settings	Counting pulse	Reset pulse	Failure	Upper stop position
Programmable	Limit switch 1	Limit switch 2	Maintenance	Maintenance

- Relais 1/2 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 6 and 7):
- After start of measurement, a reset pulse is given. It is used to reset the connected evaluation device (counter/ PLC, ...).
- Counting pulse (terminal 5 and 6):
- 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:

Timing



	Counting pulse programmed to:	ON	OFF
Start			
Reset	10cm (1/6ft) / pulse	0.13s	0.13..0.3s
Counting	5cm (1/3 ft) / pulse	0.07s	0.07..0.15s

Relais 1/2 set to Limit switch:

- It is possible to indicate two independent level limit switches. The limit switch signal is derivated from the analogue measurement signal (details see Programming page 27)
- Relay 3 - set to "Failure"
- The relay indicates a failure (see also programming on page 28 and diagnostics "Failure" on page 39)
- Relay 3 - set to "Maintenance"
- The relay indicates a necessary maintenance (see also programming on page 28 and diagnostics "Maintenance" on page 37)

Relay 4 - set to "Upper stop position"

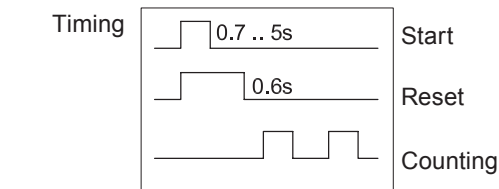
The signal allows the user to determine whether the measurement has come to its end. In this case the sensor weight is in its upper stop position, relay contacts are closed.

Relay 4 - set to "Maintenance"

The relay indicates a necessary maintenance (see also programming on page 28 and diagnostics "Maintenance" on page 37)

Signal output:
Electronic counting pulse

Counting pulse (terminal 3 and 4):
The electronic counting pulse enables a high amount of pulses to receive a high resolution of the measurement signal.



Note:
The reset pulse is done with relay 2.

Counting pulse programmed to:	ON	OFF
	2,5cm (1/10ft) / pulse	25ms
1cm (1/20ft) / pulse	10ms	10..30ms

LED status

LED	Status
Green is on	Power On
Red is on	Failure
Red is blinking	Maintenance
Yellow in on	Full detector input present
LEDs next to relais terminals	Yellow is on Relay is energised

8.2 Diagnostics signals

Failure

- Result is a non valid measurement.
- Red LED is on. Relay 3 indicates Failure.
- 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 G39.

Maintenance

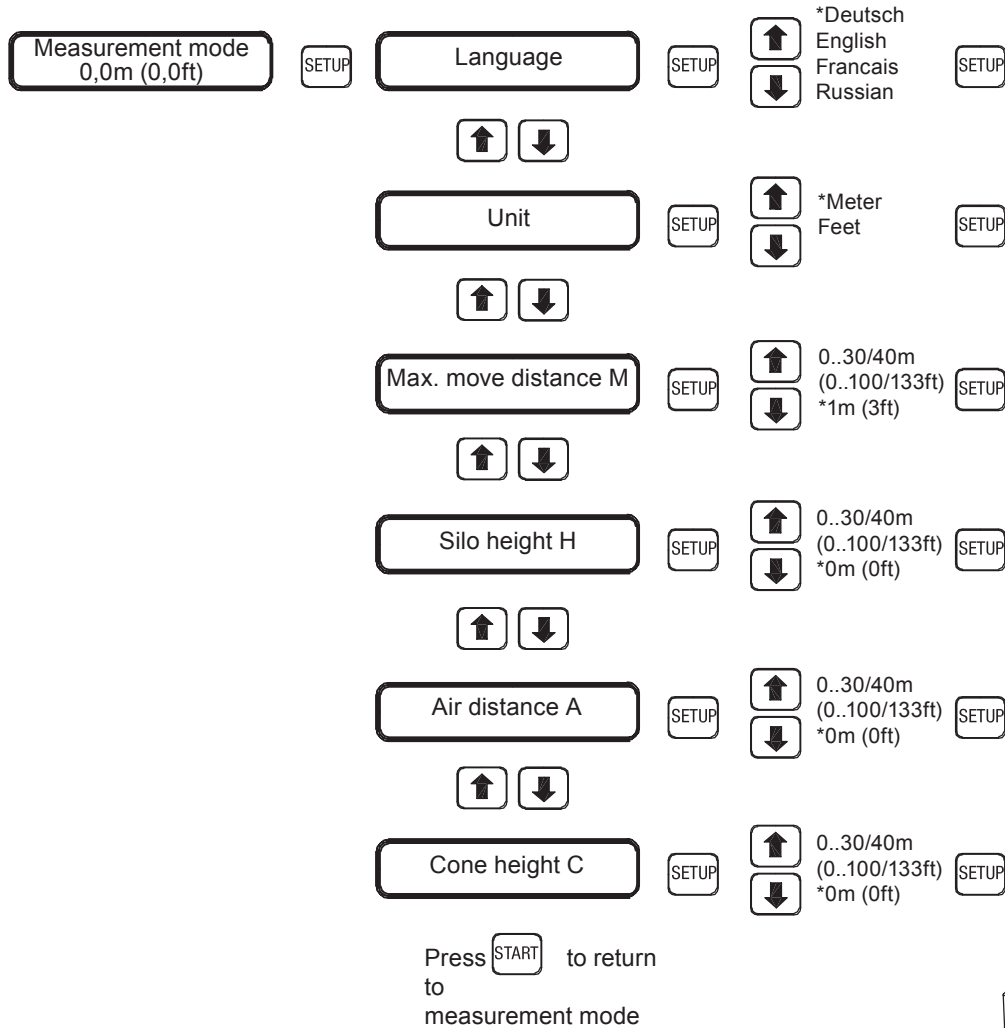
- Result is an indication for the user with still valid measurement.
- Red LED is blinking. Relay 4 indicates Maintenance (programmable).
- The signal enables a preventive maintenance. Evaluating can help to avoid losing the sensor weight inside the silo.
- If Maintenance is indicated, the measurement process can be continued.
- Maintenance codes description see page G37.

9.0 Programming SoliTrak

9.1 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.



Max. adjustable length of 30/40m depending on ordered version.

* Factory-provided

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

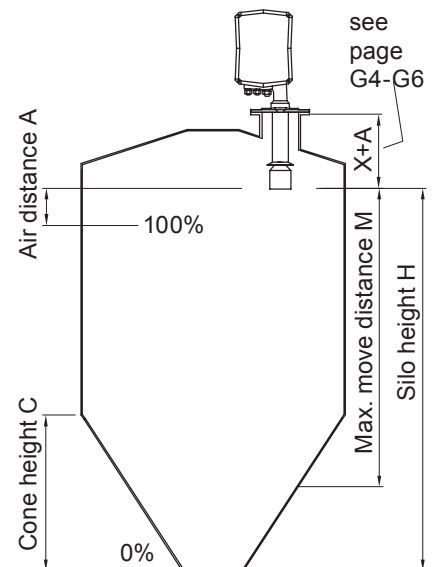
Silo height H Definition of 0% level output.
Note: If the maximum move distance M is smaller than the silo height H, the measured value will always be more than 0%.

Air distance A Definition of 100% level output.





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

Note:

When using the digital pulse output (terminal 5/6/7, see page G18/22) the parameters silo height H, air distance A and cone height C have no influence on the measurement value.






9.3 Programming buttons

-  Continues with next adjustment item
-  Continues with measurement display after parameter adjustment
Starts measurement
Cancels a Failure or Maintenance message
-  Increases the value to be adjusted
-  Decreases the value to be adjusted

9.4 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)
- Blocked 24-26 open Measurement interruption is active (terminal 24-26 not connected, see page G22)
- Blocked Modbus Measurement interruption is active (signal is set via Modbus or Remotebox SoliTrak, see also page G35)

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

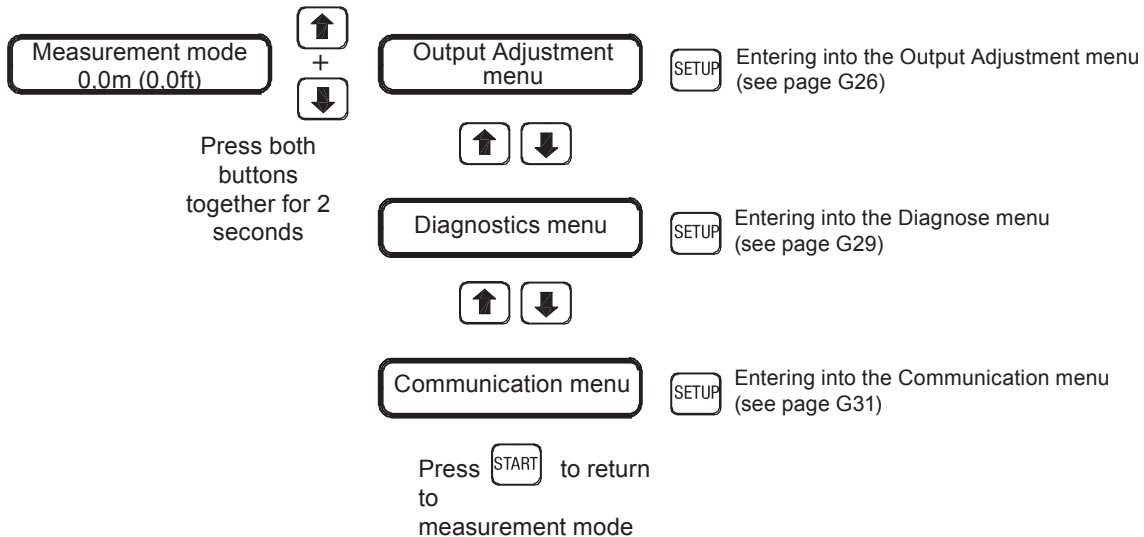
9.5 Advanced menus

(use only if necessary)

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

Entering the advanced menus:

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



9.6 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.

9.6 Output Adjustment menu

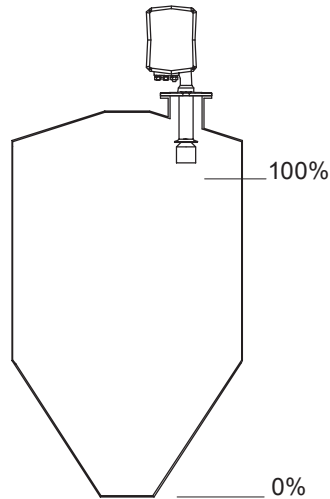
The Output Adjustment menu is used for setting the 0/4-20mA, relays and internal timer

<div style="border: 1px solid black; padding: 2px; display: inline-block;">Current output mode</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *4-20mA 0-20mA 20-4mA 20-0mA </div> <div style="margin-left: 10px;">SETUP</div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">↑</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">↓</div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Current at error</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *0mA 3.6mA 4mA 20mA 22mA Remain </div> <div style="margin-left: 10px;">SETUP</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Current error when</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *Failure Maintenance Both </div> <div style="margin-left: 10px;">SETUP</div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">↑</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">↓</div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay 1/2</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *Pulse / Reset Limit switch </div> <div style="margin-left: 10px;">SETUP</div>	After selecting Pulse /Reset: <div style="border: 1px solid black; padding: 2px; display: inline-block;">Pulse distance</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *10cm (2.5cm) 5cm (1cm) 1/3ft (1/10ft) 1/6ft (1/20ft) </div> <div style="margin-left: 10px;">SETUP</div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">↑</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">↓</div>	
	After selecting Limit switch: <div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay1 L1</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> 0..30/40m 0..100/133ft (*0m) </div> <div style="margin-left: 10px;">SETUP</div>
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay1 L2</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> 0..30/40m 0..100/133ft (*0m) </div> <div style="margin-left: 10px;">SETUP</div>
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay1 EN/ DEN</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *DEN EN </div> <div style="margin-left: 10px;">SETUP</div>
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay2 L1</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> 0..30/40m 0..100/133ft (*0m) </div> <div style="margin-left: 10px;">SETUP</div>
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay2 L2</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> 0..30/40m 0..100/133ft (*0m) </div> <div style="margin-left: 10px;">SETUP</div>
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay2 EN/ DEN</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *DEN EN </div> <div style="margin-left: 10px;">SETUP</div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay 3</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> Failure Maintenance *Both </div> <div style="margin-left: 10px;">SETUP</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay 3</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> DEN *EN </div> <div style="margin-left: 10px;">SETUP</div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">↑</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">↓</div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay 4</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *Upper stop position Maintenance </div> <div style="margin-left: 10px;">SETUP</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Relay 4</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *DEN EN </div> <div style="margin-left: 10px;">SETUP</div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">↑</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">↓</div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Timer</div> <div style="margin-left: 5px;">SETUP</div> <div style="display: inline-block; vertical-align: middle;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↑</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">↓</div> </div> <div style="margin-left: 10px;"> *OFF 0.05h/0.1h 99.9h </div> <div style="margin-left: 10px;">SETUP</div>	

Press START to return to measurement mode

* Factory provided

Current output mode



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

Current at error

In case of error (Failure, Maintenance) the current output shows the adjusted value. It can also be adjusted, whether the current output shall indicate Failure or Maintenance or both situations.

Relay 1/2

Selects, if Relay 1 and 2 shall work as Counting / Reset pulse output or as two independently programmable limit switches.

Selecting Pulse / Reset:

Relay 1 works as Counting pulse output with selected pulse rate (the values in brackets are valid for the version with Electronic counting pulse). Relay 2 works as Reset pulse. Details see Signal Overview on page G22.

Selecting Limit switch:

The relays are programmed with the distance from the sensor weight bottom to the required material surface switching point. The relays can be set to energise or de-energise. The relay logic is as follows:

DEN The relay is normally de-energised and is energised when the product rises above the L1 level. It remains energised until the product falls below the L2 level.

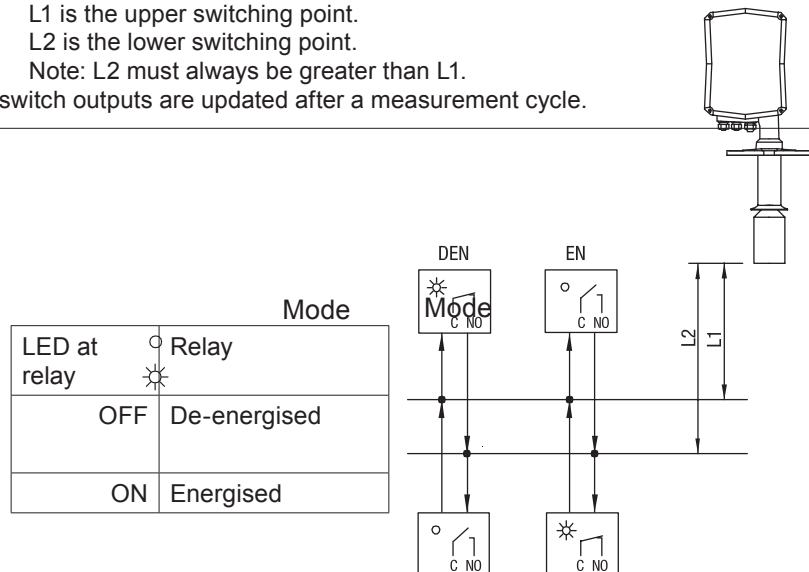
EN The relay is normally energised and is deenergised when the product rises above the L1 level. It remains deenergised until the product falls below the L2 level.

L1 L1 is the upper switching point.

L2 L2 is the lower switching point.





Note: L2 must always be greater than L1.

Note: The limit switch outputs are updated after a measurement cycle.







Relay 3

Selects, if relay 3 shall indicate Failure, Maintenance or both situations.

Failure / Maintenance	Mode DEN	Mode EN
Present		
Not present		

Relay 4

Selects, if relay 4 shall indicate "Upper stop position" or Maintenance.

Upper stop position / Maintenance	Mode DEN	Mode EN
Present		
Not present		

Timer

Automatic start of measurement with timer function.

The timing interval between two measurements can be adjusted between 0.05h (3 minutes) for the version with brushless motor (otherwise 0,1h (6 minutes)) and 99.9 hours. Position „off“ causes no automatic measurement start.

The timer will be reset:

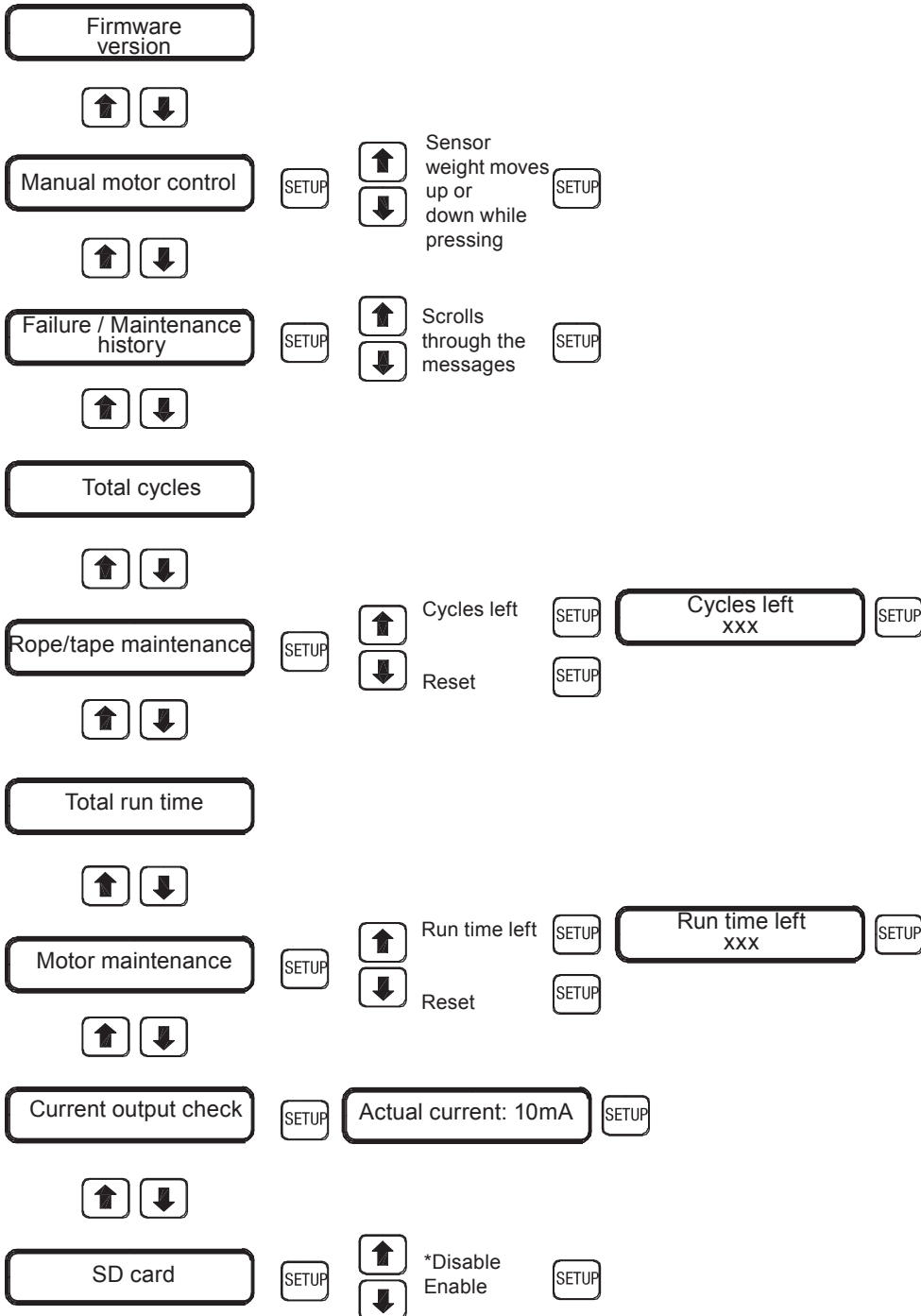
- after finishing a measurement
- after linking the terminals 24/26 (measurement interruption during filling)

For automatic measurement at a predetermined time of day, an external start unit connected to terminals 24/25/27 is necessary.

To avoid needless wear and tear, the unit should not be started more often than necessary.

9.7 Diagnostics menu

The Diagnostics menu is used to diagnose the unit status and for manual motor driving mode

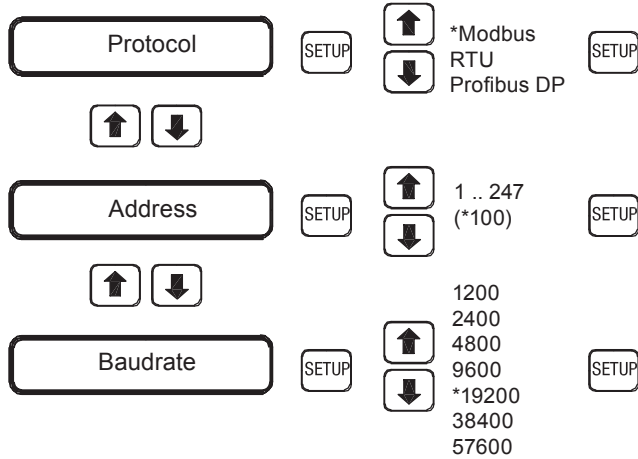


Press to return to measurement mode

Firmware version	States the firmware version of the unit.
Manual motor control	<ul style="list-style-type: none"> 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. 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. CAUTION: Avoid the sensor weight reaching the outlet position of the silo.
Failure / Maintenance history	<p>Indicates the last 93 error messages related to the motor run time after switching on the power supply for the first time. Messages can be scrolled up and down with the "ARROW" buttons. If "None" is indicated, there is no message filed. The messages and the time information are permanently filed even when the power supply is switched off. Details of the messages see page G37 - 39.</p> <p>Examples of indicating a Failure:</p> <p>Hist. 0512h 1350s 0348h 2400s +F11 Meaning: Actual motor run time is 512 hours and 1350 seconds after first power on. At 348 hours and 2400 seconds the Failure F11 came up</p> <p>Hist. 0512h 1350s 0356h 1920s -F11 Meaning: Actual motor run time is 512 hours and 1350 seconds after first power on. At 356 hours and 1920 seconds the Failure F11 was resetted</p>
Total cycles	Indicates how many measurement cycles have been performed up to now.
Rope/tape maintenance	<p>Cycles left: Indicates how many measurement cycles are left until the next rope/tape failure message F16 will appear and the unit will stop working.</p> <p>Reset: Can be done after a rope/tape change, if the Maintenance message was not yet present. It sets the internal counter to zero to have the full amount of measurement cycles until the next maintenance message will appear.</p> <p>Note 1: After a Maintenance message is reset with the "START" button, the rope/tape maintenance counter is automatically set to zero.</p> <p>Note 2: The number of preset cycles to the next maintenance message depends on the use of rope or tape version.</p>
Total run time	Indicates, how long the motor has been running upto now (in hours).
Motor maintenance	<p>Run time left: Indicates, how much motor run time (in hours) is left, until the motor failure message F17 will appear and the unit will stop working.</p> <p>Reset: Can be done after a motor change, if the Maintenance message was not yet present. It sets the internal counter to zero to have the full amount of motor run time until the next maintenance message will appear.</p> <p>Note 1: After a Maintenance message is reset with the "START" button, the motor maintenance counter is automatically set to zero.</p>
Current output check	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.
SD card	<p>Optional use for service aspects (not explained in this manual).</p> <p>After connecting a SD card to the electronics, this parameter shall be set to "Enable". Before removing the SD card, it shall be set back to "Disable".</p>

9.8 Communication Menu

The Communication menu is used for setting parameters of Modbus RTU and Profibus DP



Press **START** to return to measurement mode

* Factory provided

Protocol Selects if Modbus RTU or Profibus DP protocol is used.

Adress Selects the used communication adress.

Baudrate Selects the used baudrate.

9.9 Modbus Register

The following registers describe the communication via Modbus.

CAUTION

Writing to the registers different from what is stated will cause a miss function of the unit

Register address	Register name	Register description	Register use	Default value
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Setup

40001	M_LANGUAGE	Language on the menu DEUTSCH 0 ENGLISH 1 FRANCAIS 2 RUSSIAN 3	R/W	0
40002	M_UNIT	Unit used for distance visualisation METER 0 FEET 1	R/W	0
40003	M_MAX_MOVE_DIST	Max. move distance mm	R/W	1000
40004	M_SILO_HEIGHT	Silo height mm	R/W	0
40005	M_AIR_DIST	Air distance mm	R/W	0
40006	M_CONE_HEIGHT	Cone height mm	R/W	0
40022	M_TIMER	Timer interval (for automatic start of measurements) , in 1/100 hours (Off = 0) Notes: 1/100 hour = 36 sec Minimum time for standard motor: 0,10 hours (value =10) Minimum time for brushless motor: 0,05 hours (value = 5)	R/W	0

Measurement

40051	M_START	Start of a measurement Start 1 Note: The Modbus master must set the register back to 0 after the measurement has started. The started measurement is indicated as "Busy" in the M_STATUS register	W	
40046	M_DISTANCE	Actual measured distance, in mm Note: After the unit has finished the measurement, the M_STATUS register states "Ready, measurement valid" (the Modbus master must read the M_STATUS register). Then the data on the register M_DISTANCE is valid.	R	
40055	M_VOLUME	Actual measured volume (considering the programmed cone height), in ‰ See note on register M_DISTANCE	R	
40052	M_INHIBIT	Block command (allows to block the unit, so that no measurement can be started) No block 0 Block 1 The unit will remain blocked as long as the register has the value "Block". Note: Unit states the blocked status through the M_STATUS register.	W	0
40045	M_STATUS	States the functional status of the unit Blocked 1 Ready, measurement not valid 2 Ready, measurement valid 6 Busy 8 Failure present 16 Temporary not ready 32 -> Explanation see next page	R	

		<p>Explanation:</p> <p>Blocked: No measurement can be started.</p> <p>Ready: A new measurement can be started.</p> <p>Measurement valid: Indicates a valid measurement.</p> <p>Measurement not valid: Indicates a maintenance condition (details see M_MAINTENANCE)</p> <p>Busy: A measurement is actually running.</p> <p>Failure present: No new measurement can be started (details see M_FAILURE)</p> <p>Temporary not ready: No measurement can be started due to internal actions (usually during upwards movement of the sensor weight).</p>	R	
40057	M_FULL_DETECTOR	<p>States the full detector input status</p> <p>Contact open (24-28) 0</p> <p>Contact close (24-28) 1</p>	R	

Diagnostics

		<p>Total measured cycles up to now</p> <p>= "M_TOTAL_CYCLES" + 36535 * "M_TOTAL_CYCLES_H"</p>		
40026	M_TOTAL_CYCLES	Total measured cycles up to now, in cycles	R	
40044	M_TOTAL_CYCLES_H	Total measured cycles up to now, in 36535 cycles	R	
		<p>Measurement cycles left until failure message F16 will appear</p> <p>= "M_CYCLES_LEFT" + 36535 * "M_CYCLES_LEFT_H"</p>		
40028	M_CYCLES_LEFT	Measurement cycles left until F16 will appear, in cycles	R	
40050	M_CYCLES_LEFT_H	Measurement cycles left until F16 will appear, in 36535 cycles	R	
		<p>Total motor run time up to now</p> <p>= "M_TOTAL_RUN_TIME" hours + "M_TOTAL_RUN_TIME_S" seconds</p>		
40029	M_TOTAL_RUN_TIME	Total motor run time up to now, in hours	R	
40048	M_TOTAL_RUN_TIME_S	Total motor run time up to now, in seconds	R	
40031	M_RUN_TIME_LEFT	Motor run time left until F17 will appear, in hours	R	
40053	M_FAILURE	<p>Failure status of the unit (stated on a bit basis)</p> <p>F10 – Motor or motor-driver-electronic defect b0 = 1</p> <p>F11 – Sensor weight is buried b1 = 1</p> <p>F12 – Rope/tape broken b2 = 1</p> <p>F13 – Rope/tape too short or jammed in the rope roller b3 = 1</p> <p>F15 – Not enough current from power supply b4 = 1</p> <p>F16 – Service interval rope/tape b5 = 1</p> <p>F17 – Service interval motor b6 = 1</p>	R	
40054	M_MAINTENANCE	<p>Maintenance status of the unit (stated on a bit basis)</p> <p>M10 – Deflection pulley moves not smooth b0 = 1</p> <p>M11 – Sensor weight blocked in upper position b1 = 1</p> <p>M16 – Service interval rope/tape b3 = 1</p> <p>M17 – Service interval motor b4 = 1</p>	R	

Communication

40034	M_PROTOCOL	<p>Bus protocol used for communication</p> <p>Modbus 0</p>	R/W	0
40035	M_ADDRESS	Device address 1 to 247	R/W	31
40036	M_BAUDRATE	<p>Communication speed</p> <p>1200 baud 0</p> <p>2400 baud 1</p> <p>4800 baud 2</p> <p>9600 baud 3</p> <p>19200 baud 4</p> <p>38400 baud 5</p> <p>57600 baud 6</p>	R/W	4

R/W:read/write R:read only W:write only

Firmware Version 1.3

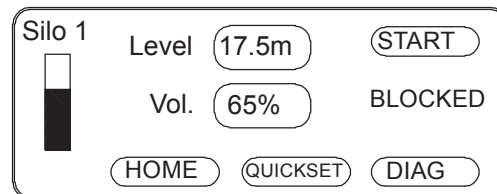
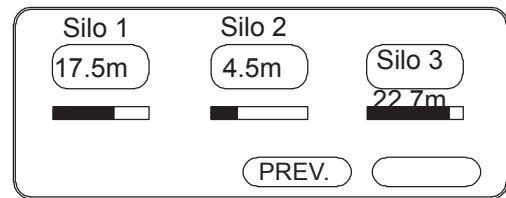
10.0 Programming SoliTrak Remote Box

10.1 General Information

Programming	<ul style="list-style-type: none"> The programming can be done either directly on the SoliTrak unit or via the Remote Box SoliTrak. If programming is done on the SoliTrak unit, no more programming of the Remote Box SoliTrak is required. All programmed data are stored in the SoliTrak unit and not in the Remote Box SoliTrak.
Addressing	<ul style="list-style-type: none"> The Remote Box SoliTrak addresses are fixed: Silo1 = Address 1, Silo 2 = Address 2 etc. The connected SoliTrak units must be set to these address (see page G31)
Baudrate	<ul style="list-style-type: none"> The Remote Box SoliTrak always works with 19200 baud. The SoliTrak units are factory provided with 19200 baud. No setting is necessary.

10.2 Programming SoliTrak Remote Box

General note	<ul style="list-style-type: none"> When operating the display can have a delayed reaction, while the actual data are beeing loaded.
Start after Power On	<ul style="list-style-type: none"> The actual Firmware version is displayed Press on the Touchscreen to enter into the the Home page
Home page	<ul style="list-style-type: none"> Three Silos are indicated per page The actual level is displayed in m (or feet), the volume as a bargraph. NEXT / PREVIOUS switches to the next or previous silos After switching on the power supply, the number of connected SoliTrak must be set (setting on the last page next to Silo 10). If a "!" is stated in the level display, there is no communication between Remote Box SoliTrak and SoliTrak. (Check adress setting on the SoliTrak units, set the number of connected SoliTrak next to Silo 10) A flashing level display indicates, that a Maintenance or Failure message is present. Press on a Silo to enter in the Overview page per silo
Overview page per silo	<ul style="list-style-type: none"> There is one page per silo The actual level, volume and volume bargraph is displayed. A flashing display indicates, that a Maintenance or Failure message is present. START will start a measurement of the respective SoliTrak. After the sensor weight has reached the material surface, the display is updated. BLOCKED is displayed, if the measurement interruption is active and no measurement can be started. This could be done manually (see Quickset page below) or by the measurement interruption input (see page G17 and G22) . HOME switches back to Home page QUICKSET switches to Quickset page DIAG switches to Diagnose page



Quickset page

- Programming of:
Max. move distance M
Silo Height H
Air Distance A
Cone height
See page G24 for details.

Programming via keypad after pressing the touchscreen at the spot, where the value is stated. Confirm with ENTER.

If the programmed values are out of range, the values are first stated in the display, but then will be changed to the max. possible values after a few seconds.

A flashing display indicates, that the SoliTrak is actually been programmed on the silo.

Note: The 4-20mA output is automatically programmed by setting these values.

- NEXT switches to Quickset page 2
- TIMER sets the timer for automatic starting (see page G28)
- BLOCKED or ENABLED avoids or enables the start of a measurement (measurement interruption)
- BACK switches to the Overview page per silo.

Diagnostics page

- Displays if a Failure or Maintenance message is present. The respective box is highlighted and states the Failure or Maintenance code. See page G37-39 for details.

Note 1: In case of Failure or Maintenance, the level display on the Home page and Overview page per silo will flash.

Note 2: The messages cannot be reset from the Remote Box, but must be reset on the silo, because an action on site is required.

NEXT switches to Diagnostics page 2

- ROPE/TAPE CYCLES
see page G30
- MOTOR RUN TIME
see page G30
- BACK switches to the Overview page per silo.

11.0 Commissioning: Interface measurement

11.1 General items

Applications	Measurement of solids in water like mud, sand, bed ash, sediment, stones etc. Rope version: The material surface can be soft / muddy or compact. Sensitivity adjustment possible. Tape version: The material surface must be compact (the sensor weight cannot sink in). No sensitivity adjustment possible.
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Principle	The sensor weight penetrates into the water and stops when touching the solid surface.
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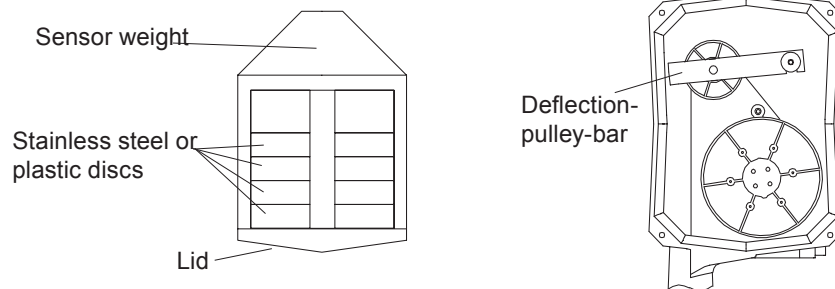
11.2 Sensitivity adjustment (rope version)

General	The sensitivity (needed release force for the sensor weight when touching the solid surface) can be set to the requirements of the application. Sensitivity adjustment is done by lowering the sensor weight into the water by using the "Manual motor control" (see page G29).
---------	--

1. Coarse adjustment	Coarse adjustment is done to avoid the detection of the water surface.
----------------------	--

When penetrating into the water, the weight must not float. This can be checked by watching the deflection-pulley-bar. If the deflection-pulley-bar will move briefly upwards while penetrating into the water, the sensor weight floats and needs to be heavier. This is achieved by unscrewing the lid of the sensor weight and replacing one or more plastic discs by stainless steel discs. For soft/muddy surfaces the sensor weight shall be as light as possible to keep it from sinking into the bulk material surface (see step 2).

Note: It is important that the sensor weight is completely filled with discs to avoid intrusion of air.

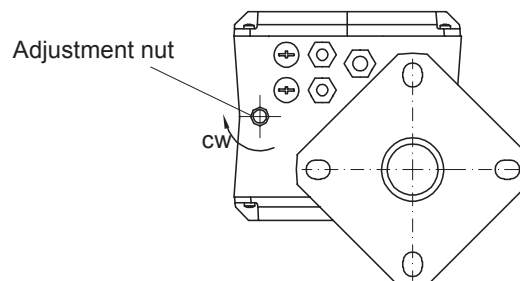


2. Fine adjustment

Fine adjustment is done to keep the sensor weight from sinking into a soft/muddy material surface.

- Turn adjustment nut anti clockwise: measurement becomes more sensitive (for soft/muddy surface)
- Turn adjustment nut clockwise: measurement becomes less sensitive (for more compact surface)
- Fix the adjustment nut with the counter nut

The adjustment was successful if the sensor weight penetrates the water surface easily and detects the material surface without sinking in.



12.0 Diagnostics

11.1 Maintenance

Result is an indication for the user with still valid measurement.

Red LED is blinking. Relay 4 indicates Maintenance (programmable).

The signal enables a preventive maintenance. Evaluating the signal can help to avoid losing the sensor weight inside the silo.

If Maintenance was indicated, the measurement process can be continued.

Maintenance code	Description	Performance of the device	Solution
M10	Deflection pulley moves not smooth / regular	<ul style="list-style-type: none"> Message is shown, measurement can be continued. If the following 5 measurement cycles after indication are o.k., the message will automatically disappear. 	<p>Check for proper movement of the pulley.</p> <p>Check for possible slipping of the rope/tape on the pulley.</p>
M11	Sensor weight blocked in "upper stop position" or block distance of sensor weight to short	<ul style="list-style-type: none"> 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. 	<p>Release sensor weight.</p> <p>Ensure, that the min. moving distance (block distance) is > 200mm (7.87")</p>
M12	SD card not working properly	<ul style="list-style-type: none"> In the diagnose menu the setting "SD card Enable" is done but SD card is not present or not working properly 	<p>Set the menu to "SD card Disable" or change SD card</p>
M16	Service interval: rope / tape	<ul style="list-style-type: none"> The amount of measurement cycles has reached 70% of the rope/tape lifetime. To further guarantee faultless performance, it is strongly recommended to change the rope/tape. After resetting the message, the internal counter for the rope/tape cycles is reset to zero. If the message is not reset, the unit will continue measuring, until 90% of the rope/tape lifetime is reached. Then Failure F16 will come up. 	<p>Change rope /tape.</p>
M17	Service interval: motor	<ul style="list-style-type: none"> The actual run time has reached 70% of the motor lifetime. To further guarantee faultless performance, it is strongly recommended to change the motor. After resetting the message, the internal counter for the motor run time is reset to zero. If the message is not reset, the unit will continue measuring, until 90% of the motor lifetime is reached. Then Failure F17 will come up. 	<p>Change motor</p>

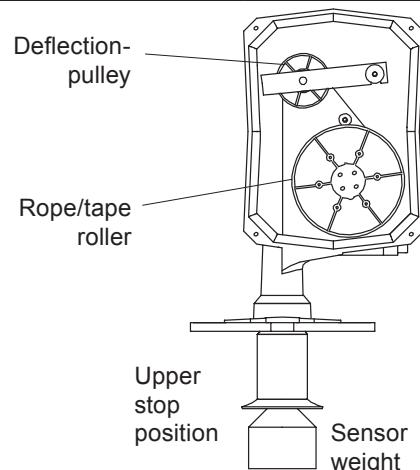
By pushing the START button the actual stated messages shown on the display can be reset.

If more than one message is present, the one with a lower code is shown on the display. After reset with the START button, the next one will be stated.

Possibilities to see a maintenance history: see page G29.

CAUTION

Before removing the rope/tape roller, remount the unit from the silo to avoid, that the sensor weight can fall into the silo.



Rope/Tape lifetime

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

Rope version: approx. 100000

Tape version: approx. 250000

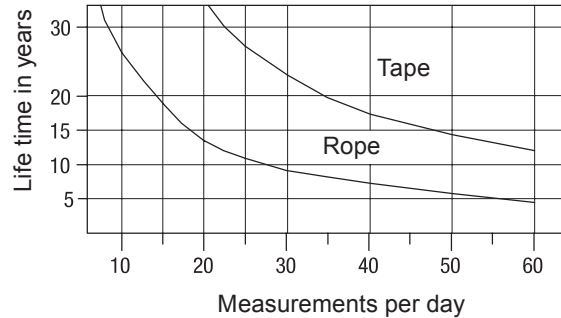
Note: These values refer to lifetime tests under the following conditions:

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 maintenance message is displayed at 70%, the failure message at 90% of the expected lifetime to provide some safety. For further information see message M16 and 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

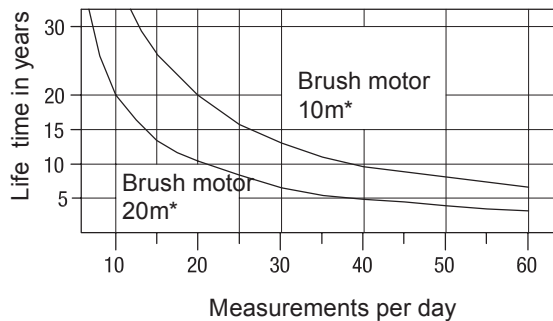
The expected life time (run time) for the motor is:

Version for high measurement frequency (brushless motor): approx. 60000 hours

Version with standard motor (brush motor): approx. 3500 hours

The maintenance message is displayed at 70%, the failure message at 90% of the expected lifetime to consider some safety. For further informations see message M17 and F17.

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



*average measurement distance

12.2 Failure

Result is an invalid measurement.

Red LED is on. Relay 3 indicates Failure.

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	Motor or motor-driver-electronic defect	Motor does not rotate when it is actuated. Evaluation by the hallsensor on the rope/tape roller.	If possible, the sensor weight will be moved up to the "Upper stop position".	Check motor connection. Motor or electronic change.
F11	Sensor weight is buried or jammed	Difference of distance between down and up movement too big. Evaluation by the hallsensor on the rope/tape roller.	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. Evaluation by the hallsensor on the rope/tape roller on the deflection pulley bar.	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	Rope / tape too short or rope jammed in the rope roller	The deflection pulley and the rope/tape roller move in different directions. Evaluation by the Hall sensors on the pulley and the rope/tape roller.	Motor direction is selected so the sensor weight moves upwards until upper stop position is reached.	Check if the rope/tape is too short compared to the adjusted minimum safety setting. Check if the rope is jammed in the rope roller and wound in the wrong direction.
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. See also maintenance message M16.	The measurement cannot be restarted.	Change rope or tape.
F17	Service interval: motor	The actual run time is 90% of the motor lifetime. See also maintenance message M17.	The measurement cannot be restarted.	Change motor.

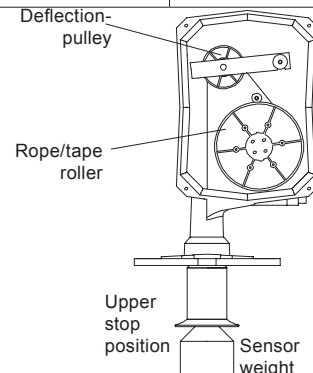
By pushing the START and SETUP button together for 2 seconds, the message shown on the display can be reset.

Possibilities to see a failure history: see page G29.

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.

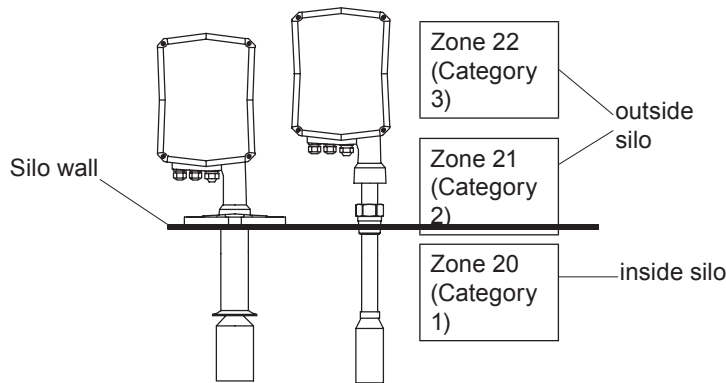


Notes for use in Hazardous Locations

ATEX Zone classification

Category	useable in zone	* in case of conductive dust, additional requirements for installation are necessary.
1 D	20, 21, 22	
2 D	21, 22	
3 D*	22	

Permitted zones (categories) for mounting in partition wall



General notes

Marking Devices with Ex-approval are marked on the type plate.

Process pressure for ATEX The device construction allows process over-pressure up to 0.3bar (4.4psi) (option 1.7bar (25psi)). These pressures are allowed for test purposes. The definition of the ATEX is only valid for a silo-over-pressure between -0.2..+0.1 bar (-2.9..+1.45psi). Outside of these pressures the approval is not valid.

Process and ambient temperature The permitted temperature ranges are marked on the type plate.

Notes for use in Hazardous Locations

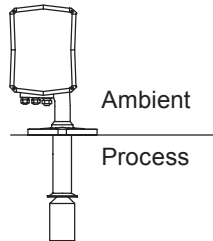
Maximum Surface Temperature

The temperature marking on the name plate  refers to the instruction manual.

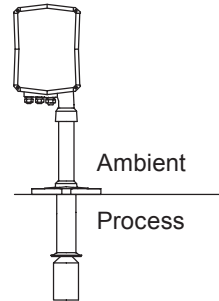
On the following table the relevant temperature ratings are shown.

The maximum surface temperature and the temperature class refer to the warmest area outside on the unit which can occur in failure case (according to EX definition).

Version for
process temperature
max. 80°C (176°F) /
max. 150°C (302°F)



Version for
process temperature
max. 250°C (482°F)



Max. ambient temperature	Max. process temperature	Max. surface temperature	Temp. class
60°C (140°F)	80°C (176°F)	130°C (266°F)	T4
40°C (104°F)	90°C (194°F)	130°C (266°F)	T4
	100°C (212°F)	130°C (266°F)	T4
	110°C (230°F)	130°C (266°F)	T4
	120°C (248°F)	130°C (266°F)	T4
	130°C (266°F)	130°C (266°F)	T4
	135°C (275°F)	135°C (275°F)	T4
	140°C (284°F)	140°C (284°F)	T3C
	150°C (302°F)	150°C (302°F)	T3C

Max. ambient temperature	Max. process temperature	Max. surface temperature	Temp. class
60°C (140°F)	80°C (176°F)	130°C (266°F)	T4
	130°C (266°F)	130°C (266°F)	T4
	135°C (275°F)	135°C (275°F)	T4
	140°C (284°F)	140°C (284°F)	T3C
	150°C (302°F)	150°C (302°F)	T3C
	160°C (320°F)	160°C (320°F)	T3C
	165°C (329°F)	165°C (329°F)	T3B
	170°C (338°F)	170°C (338°F)	T3A
	180°C (356°F)	180°C (356°F)	T3A
	190°C (374°F)	190°C (374°F)	T3
	200°C (392°F)	200°C (392°F)	T3
	210°C (410°F)	210°C (410°F)	T2D
	215°C (419°F)	215°C (419°F)	T2D
	220°C (428°F)	220°C (428°F)	T2C
	230°C (446°F)	230°C (446°F)	T2C
240°C (464°F)	240°C (464°F)	T2B	
250°C (482°F)	250°C (482°F)	T2B	

Static discharge of the material surface

It must be ensured that no static discharge can occur when the grounded metal sensor weight or rope /tape touches the surface of the bulk material. If this can not be ensured, the safe use of the unit is NOT guaranteed. The responsibility for this rests with the user. In case of in clarity an assessment from a notified body is necessary.

From the manufacturer side a version with a plastic sensor weight and additional plastic rope insulation part is available on request. This keeps a 500mm (19.7") distance from the material surface to the grounded rope/tape.

13.0 CUSTOMER SUPPORT

K-TEK Solids Level (USA, Canada, International)

6100 West by Northwest #140
Houston, TX 77040 USA
Tel: (1) 713.462.7665
Toll Free 800.245.7056
Fax: (1) 713.462.7684
Email: service@kteksolidslevel.com
Website: kteksolidslevel.com



13.1 K-TEK Solids Level RMA Form



K-TEK Solids Level
 6100 West by Northwest #140
 Houston, TX 77040 USA
 Phone: (1) 713.462.7665
 Fax: (1) 713.462.7684
 Email: service@kteksolidslevel.com

***** IMPORTANT CUSTOMER NOTICE: PLEASE READ PRIOR TO RETURNING PRODUCTS TO K-TEK*****

Be sure to include the Return Authorization (RA) number on the shipping label or package to the attention: Customer Service. A copy of this document should also be included with the packing list. K-TEK Solids Level wants to maintain a safe work environment for its employees. In the event, the returned product or material has been in contact with a potentially hazardous chemical, per federal regulations, the customer must provide evidence of decantamination and the related chemical composition and characteristics. In order to expedite your return, please include the applicable Material Safety Data Sheets (MSDS) and decontamination tags by affixing these documents in close proximity to the shipment label for identification purposes.

Return Authorization Form			
Customer:	Contact Name:		
Contact Phone:	Contact Email:		
Contact Fax:			
Date:	Service Rep:		
Completed by Customer			
Product	Serial Number	Job Number	
Reason:			
Is expedited return shipping requested? <input type="checkbox"/> Yes <i>If yes, please provide a purchase order or your shipper's account number (ex FedEx or UPS). K-TEK Solids Level pays return transport via standard ground shipments only.</i>			
If purchase order is issued, a copy of purchase order must be included with return authorization documentation.			Account #:
Is K-TEK Solids Level authorized to repair items determined to be non-warranty? <input type="checkbox"/> Yes <i>If yes, a copy of purchase order must be included with return authorization documentation.</i>			
Customer PO#:		Date:	
Has product been in contact with any potentially hazardous chemical? <input type="checkbox"/> Yes <i>If yes, documentation product and forward MSDS to K-TEK Solids Level. "ATTN: Customer Service"</i>			
Return Repaired Product to Address			
Shipping Address:		Billing Address:	
		Ship Via:	

14.0 WARRANTY

3 YEAR WARRANTY FOR:

KCAP300 & KCAP400 capacitance switches.

2 YEAR WARRANTY FOR:

MT5200 radar level transmitter; KP paddle switches; A02, A75 & A77 RF capacitance level switches.

1 YEAR WARRANTY FOR:

LaserMeter series laser transmitters; LPM200 digital indicator; DPM100 digital indicators; APM100 analog indicators; KVIEW series digital indicators and controllers; SF50 and SF60 vibrating fork switches, KSONIK ultrasonic level switches, transmitters & transducers, ChuteMaster Microwave Transmitter / Receiver and TiltMaster Switches.

SPECIAL WARRANTY CONSIDERATIONS:

K-TEK Solids Level will repair or replace, at K-TEK Solids Level's election, defective items which are returned to K-TEK Solids Level by the original purchaser within the period specified above from the shipment date of the item and which is found, upon examination by K-TEK Solids Level, to its satisfaction, to contain defects in materials or workmanship which arose only under normal use and service and which were not the result of either alterations, misuse, abuse, improper or inadequate adjustments, applications or servicing of the product. K-TEK Solids Level's warranty does not include onsite repair or services. Field service rates can be supplied on request.

If a product is believed to be defective, the original purchaser shall notify K-TEK Solids Level and request a Returned Material Authorization before returning the material to K-TEK Solids Level, with transportation prepaid by the purchaser. (To expedite all returns/repairs from outside of the United States, consult K-TEK Solids Level's customer service team (service@kteksolidslevel.com) to determine an optimal solution for shipping method and turnaround time.) The product, with repaired or replaced parts, shall be returned to the purchaser at any point in the world with transportation prepaid by K-TEK Solids Level for best-way transportation only. K-TEK Solids Level is not responsible for expedited shipping charges. If the product is shipped to K-TEK Solids Level freight collect, then it will be returned to the customer freight collect.

If inspection by K-TEK Solids Level does not disclose any defects in material or workmanship, K-TEK Solids Level's normal charges for repair and shipment shall apply (minimum 250.00 USD).

The materials of construction for all K-TEK Solids Level products are clearly specified and it is the responsibility of the purchaser to determine the compatibility of the materials for the application.

THE FOREGOING WARRANTY IS K-TEK SOLIDS LEVEL'S SOLE WARRANTY AND ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE, ARE EXCLUDED AND NEGATED TO THE MAXIMUM EXTENT PERMITTED BY LAW. NO PERSON OR REPRESENTATIVE IS AUTHORIZED TO EXTEND ANY OTHER WARRANTY OR CREATE FOR K-TEK SOLIDS LEVEL ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF K-TEK SOLIDS LEVEL'S PRODUCTS. THE REMEDIES SET FORTH IN THIS WARRANTY ARE EXCLUSIVE OF ALL OTHER REMEDIES AGAINST K-TEK SOLIDS LEVEL. K-TEK SOLIDS LEVEL SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, OR SPECIAL DAMAGES OF ANY KIND. K-TEK SOLIDS LEVEL'S SOLE OBLIGATION SHALL BE TO REPAIR OR REPLACE PARTS (FOUND TO BE DEFECTIVE IN MATERIALS OR WORKMANSHIP) WHICH ARE RETURNED BY THE PURCHASER TO K-TEK SOLIDS LEVEL.

SoliTrak

Electro-Mechanical On Demand Level Measurement (Plumb Bob Device)



SoliTrak

Electro-Mechanical On Demand Level Measurement (Plumb Bob Device)



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Electro-Mechanical On Demand Level Measurement (Plumb Bob Device)





For the latest version of this manual, visit kteksolidslevel.com.

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