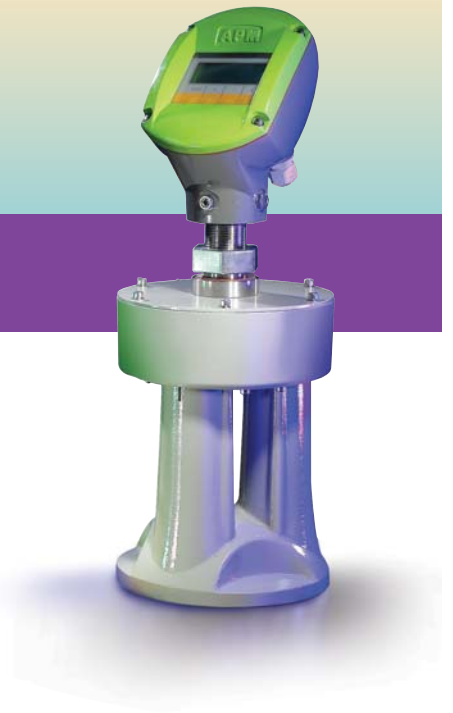


3D LevelScanner

S | M | MV

QUICK INSTALLATION GUIDE

Level & Volume
measurement in solid
applications with
mapping capabilities





APM 3DLevelScanner S/M/MV Quick Installation Guide

Version 1.0

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Overview

The APM 3DLevelScanner™ is an innovative new device that continuously measures the level, volume, and mass of materials inside a silo or an open bin.

The 3DLevelScanner employs a two-dimensional array-beam former to transmit low frequency pulses and receive echoes of the pulses from the contents of the silo, bin, or any other container. The device's digital signal processor samples and analyzes the received signals. The processor uses the time and direction parameters of the received echoes to generate a three-dimensional image of the surface, which can be displayed on a remote monitor. The system can accurately determine the volume and mass of material, enabling an unrivaled degree of process measurement and inventory control.

The Quick Installation Guide describes, step by step, how to quickly setup and safely operate the APM 3DLevelScanner. The quick installation guide is designed for trained personnel only. Please read it carefully before proceeding with the installation.



Installing and using the 3DLevelScanner requires strict observance of standard safety regulations and guidelines. Follow all safety instructions in the quick installation guide and the operation manual. In addition, adhere to all country-specific installation standards (for example, the VDE regulations in Germany) and all common safety regulations and accident prevention rules.

Inappropriate or incorrect use of the 3DLevelScanner can cause application-specific hazards such as overfilling the vessel. Incorrect mounting or adjustments can cause damage to system components.



Installation Kit

The APM 3DLevelScanner installation kit contains the following items:

- ① Documentation.
- ① 3DLevel Manager Software CD.
- ① 3DLevelScanner Sensor – see *Figure 1*.

Components

Figure 1 shows the 3DLevelScanner Sensor.

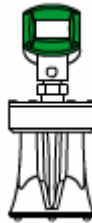


Figure 1 3DLevelScanner Sensor

The 3DLevelScanner Sensor contains the following components:

- ① Special horn antenna.



Figure 2 Special Horn Antenna

- ① Process fitting (the type depends on flange or thread version).

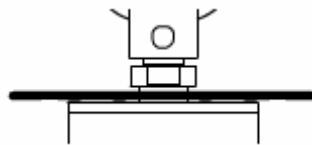


Figure 3 Process Fitting

- ① Electronics housing.



Figure 4 Electronics Housing.



Site Preparations

This chapter describes how to prepare the site for installation of the 3DLevelScanner. It includes guidelines for optimal positioning and fitting of the scanner.



The site preparations described in this section must be verified and completed before starting installation. To enable optimal installation, ensure that the 3DLevelScanner can be positioned and fitted according to the guidelines described in this section.



For a list of items recommended to prepare before installing the 3DLevelScanner, refer to *Recommended Tools and Materials* on page 31.

Power

A 24VDC (2W) power supply must be prepared and ready to use close to the place where the scanner will be mounted. The voltage supply and current output are carried along separate two-wire connection cables.

Communication

The communication cables provide the HART/RS485 communication.

A 5...9 mm two-wire, shielded twisted pair communication cable must be prepared and ready to use between the following:

- ⦿ The installation position on top of the vessel where the scanner will be mounted.
- ⦿ The control room/place where the computer will be placed.



Positioning

Prepare the installation point according to the following guidelines:

- ① The scanner should be installed as far away as possible from the inflowing material, as shown in *Figure 5*.

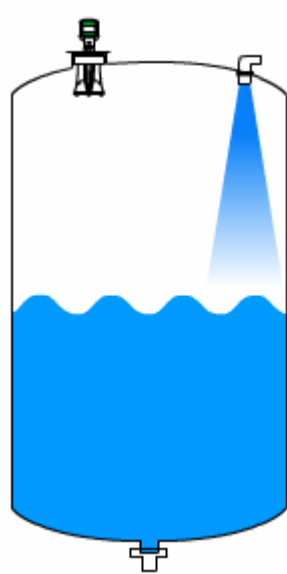


Figure 5 Installation Point

- ① The installation point in the vessel must be at least 0.5 meters from the side of the vessel, as shown in *Figure 6*. The most optimal place is between the silo side and the silo center.

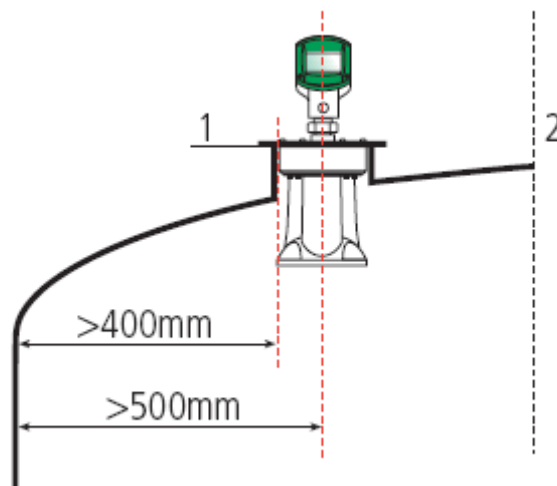


Figure 6 Closed Vessel Installation



- ⦿ The optimal position for the scanner is halfway between the center and the side of the vessel, as shown in *Figure 7*. Do not install the scanner in the center of the vessel.

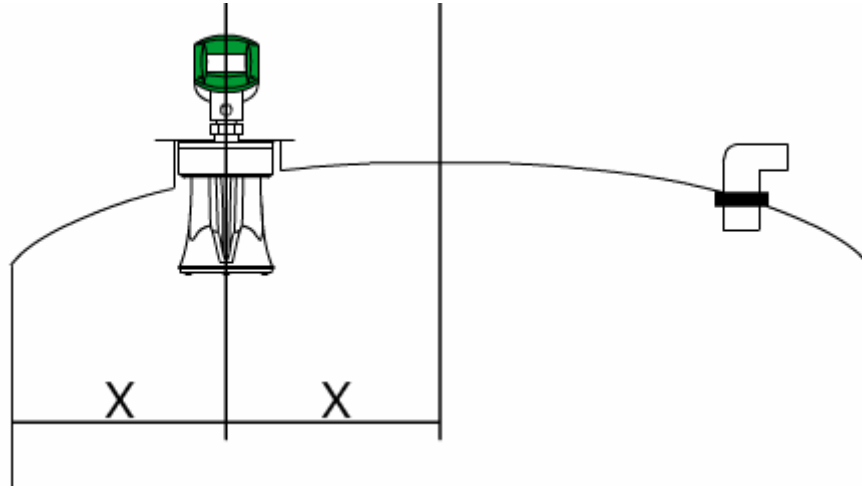


Figure 7 Optimal Position

- ⦿ When mounted in a closed vessel (for example a silo), the hole for the scanner must be at least 200 mm, and not more than the diameter of the flange or thread.

Fitting

Prepare the fitting area for the scanner according to the following guidelines:

- ⦿ The scanner must be mounted in a vertical position so that the horns/antennas are at a 90° angle to the ground, as shown in *Figure 8*.

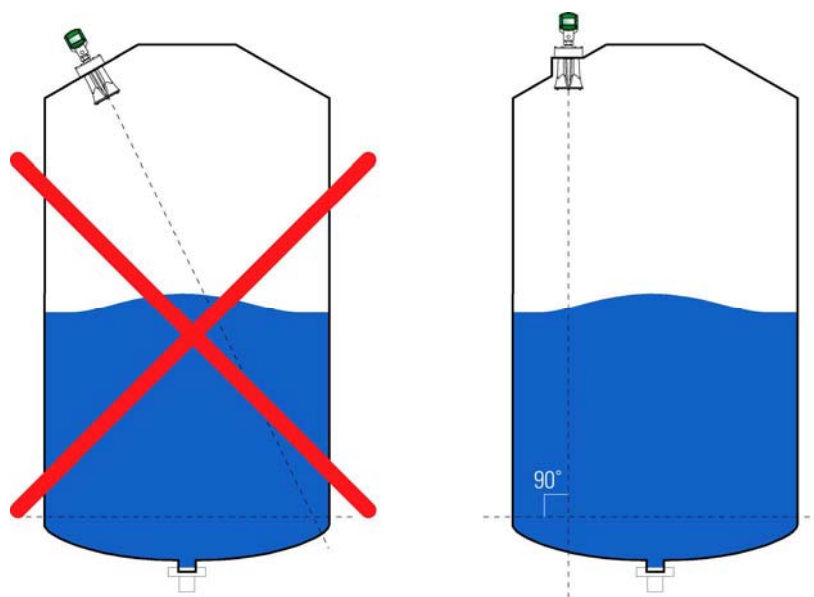


Figure 8 Mounting Positions



- Ensure that the bottom of the scanner (antennas) protrudes at least 10 mm (0.4 inch) out of the socket, as shown in *Figure 9*. Ensure that no rails or frames interfere with the beam (opening angle) of the scanner, as shown in *Figure 10*. Interference can reduce the signal to noise ratio (SNR) and damage signals coming back to the scanner.

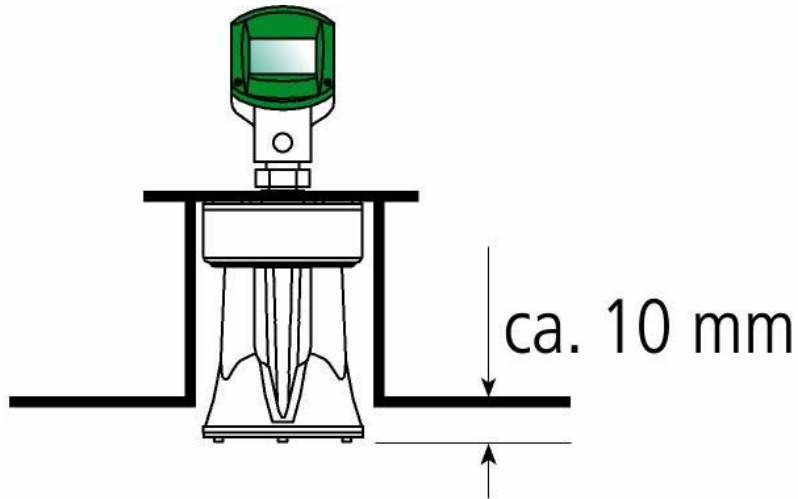


Figure 9 Antennas Location

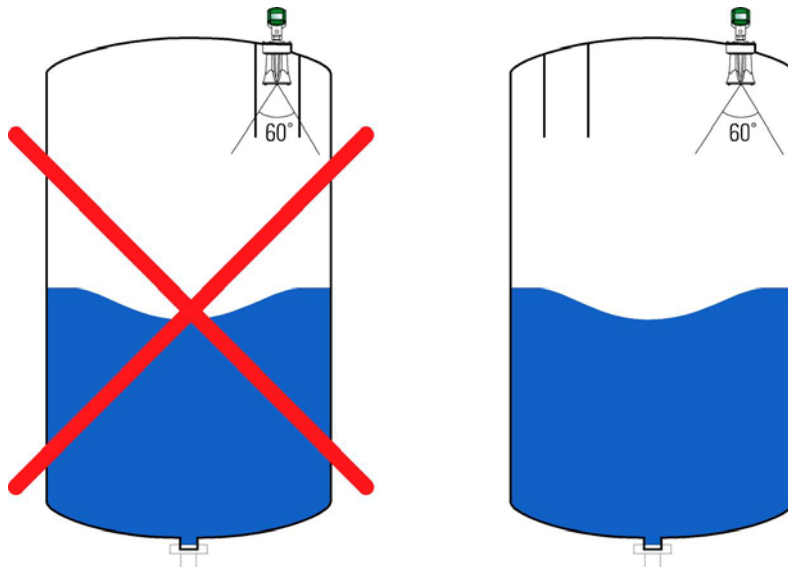


Figure 10 Scanner Beam



Installing the Scanner

This chapter describes how to physically install the 3DLevelScanner and connect the communication cables.

Installing the Flange in the Scanner



When removing or reinstalling the scanner head, you must perform the tasks in the order described in the following procedures.

Removing the Scanner Head

To insert the flange you must remove the scanner head.

To remove the scanner head:

1. Loosen the four screws on the scanner front panel and remove the front panel.

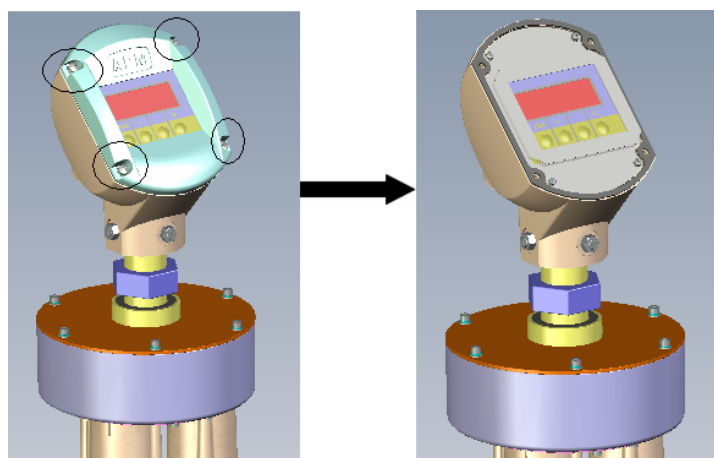


Figure 11 Removing the Front Panel



2. Loosen the four screws of the scanner rear panel on the back of the scanner head and remove the rear panel. The screws are captive and will not fall off.

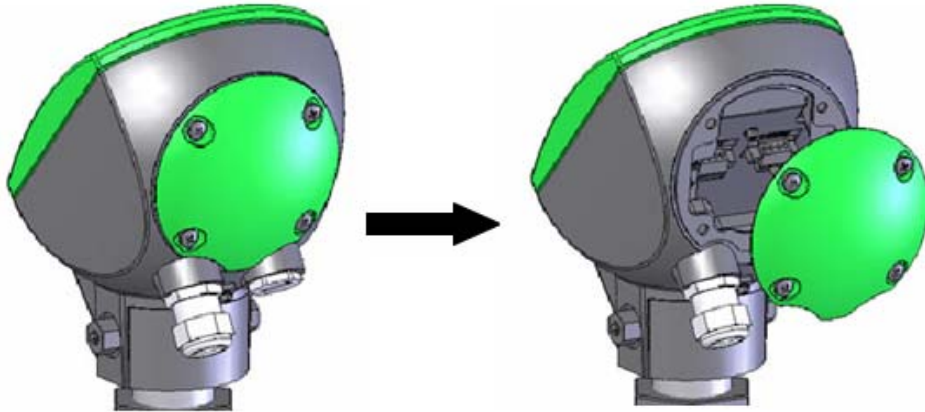


Figure 12 Removing the Rear Panel

3. Carefully loosen the four screws that secure the electronic card to the scanner head. The screws are not captive and might fall off.

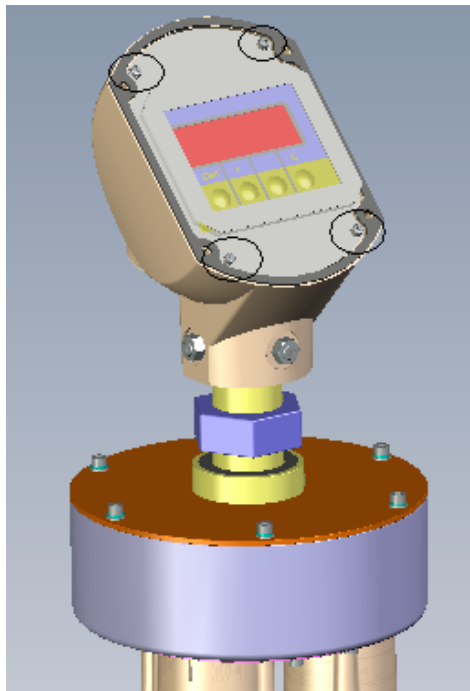


Figure 13 Electronic Card Securing Screws

4. Carefully pull the electronic card out 2 cm from the scanner head and unplug the white connector, on the back of the electronic card, from the rear side of the scanner head (this cable connects the electronic card to the transducers and the thermistor). To release the white connector, carefully push and pull the trigger on the white connector (see *Figure 14*).



When pulling the electronic card out from the scanner head, take care not to damage the connector on the electronic card. A damaged connector can lead to disconnection of one of the transducers, and cause the scanner to malfunction.

Handle the reverse connector on the electronic card carefully.

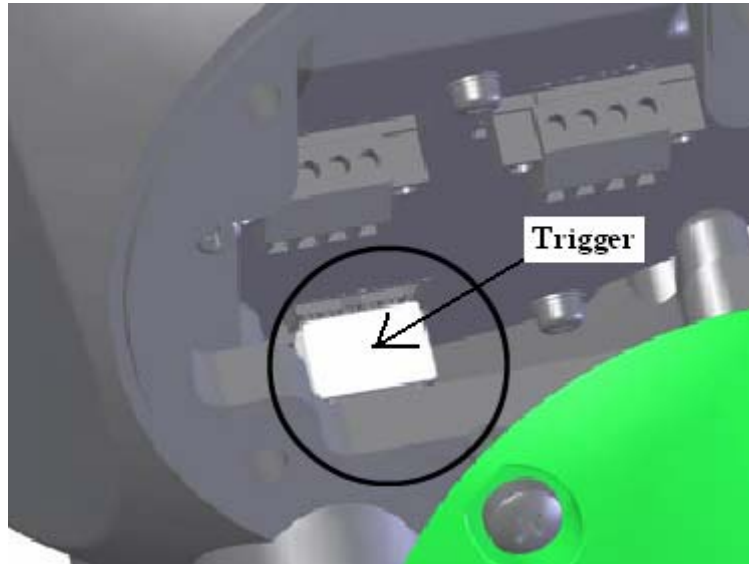


Figure 14 White Connector

5. Using a size 13 wrench, remove the three nuts on the scanner head.
6. Using a size 4 Allen key, remove the three screws on the scanner head.



Figure 15 Removing Scanner Head Nuts and Screws



7. Carefully pull the scanner head off the neck tube.



Figure 16 Removing the Scanner from the Neck Tube



Ensure that the rubber ring on the neck tube remains in place (see *Figure 17*).

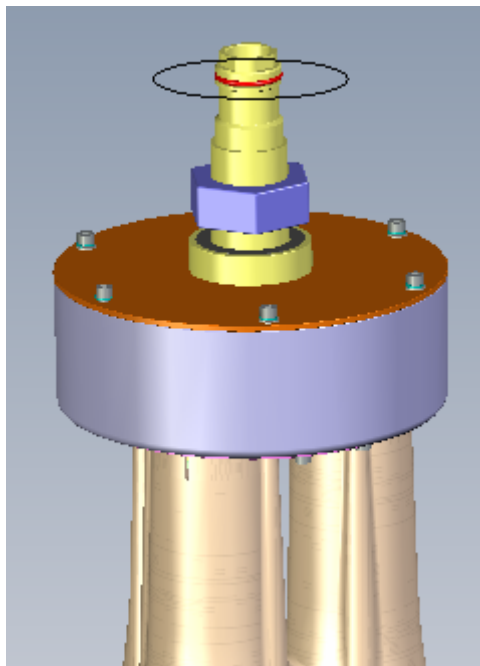


Figure 17 Neck Tube Rubber Ring



- Using a size 18 adjustable wrench, remove the bolt from the neck tube.



Figure 18 Removing the Neck Tube Bolt

- Insert the flange onto the neck tube.



Figure 19 Inserting the Flange



Reinstalling the Scanner Head

After installing the flange you must reinstall the scanner head.



Before reinstalling the scanner head, it is recommended to grease the rubber ring on the neck tube (see *Figure 17*). This makes it easier to push the scanner head into the correct position on the neck tube.

To reinstall the scanner head:

1. Repeat the steps described in *Removing the Scanner Head* on page 7 in reverse order.
2. Ensure that all the screws and nuts are tightly secured.



If the nut on the neck tube is not screwed tight to the flange, add a washer between the nut and the flange.

When placing the scanner head back onto the neck tube, it is important to push the scanner head all the way down on the neck tube until the top of the neck tube reaches the head's inner surface (as shown in *Figure 20*).

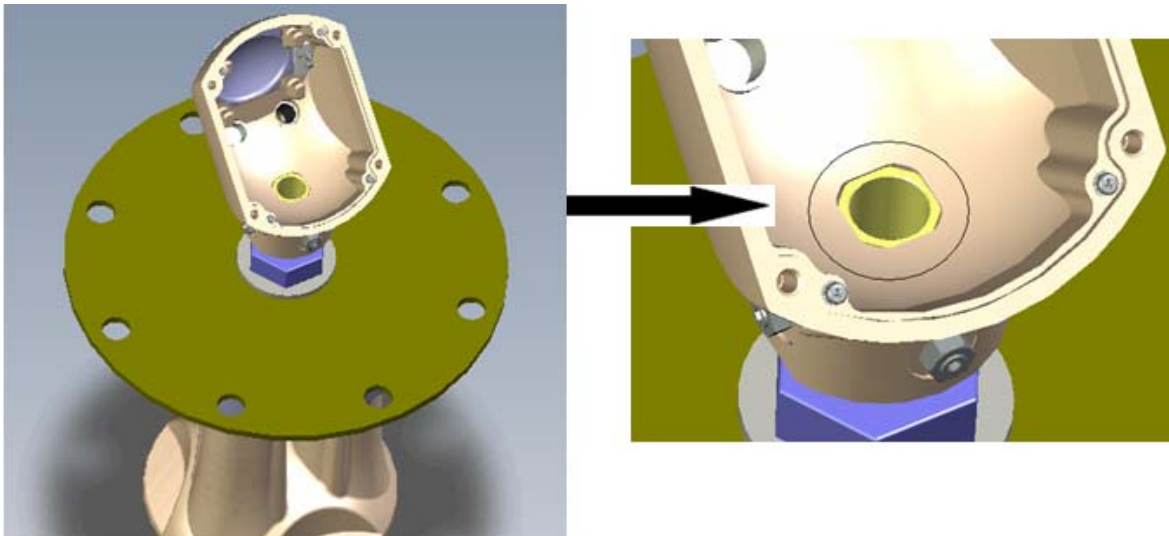


Figure 20 Reinstalling the Scanner Head



Mounting the Scanner

After installing the flange and reinstalling the scanner head, the scanner is ready to be mounted.

To mount the scanner:

1. Mount the scanner in the correct direction, as described in *Mounting Direction*. This is required in order to scale and adjust the position of the unit.
2. Mount the scanner according to the guidelines described in *Site Preparations* on page 6.

Mounting Direction

- ⦿ The mounting direction is indicated by a sticker labeled 0^0 on the unit (see Figure 21).
- ⦿ The 0^0 should point to the center of the vessel (including square vessels and open bins).

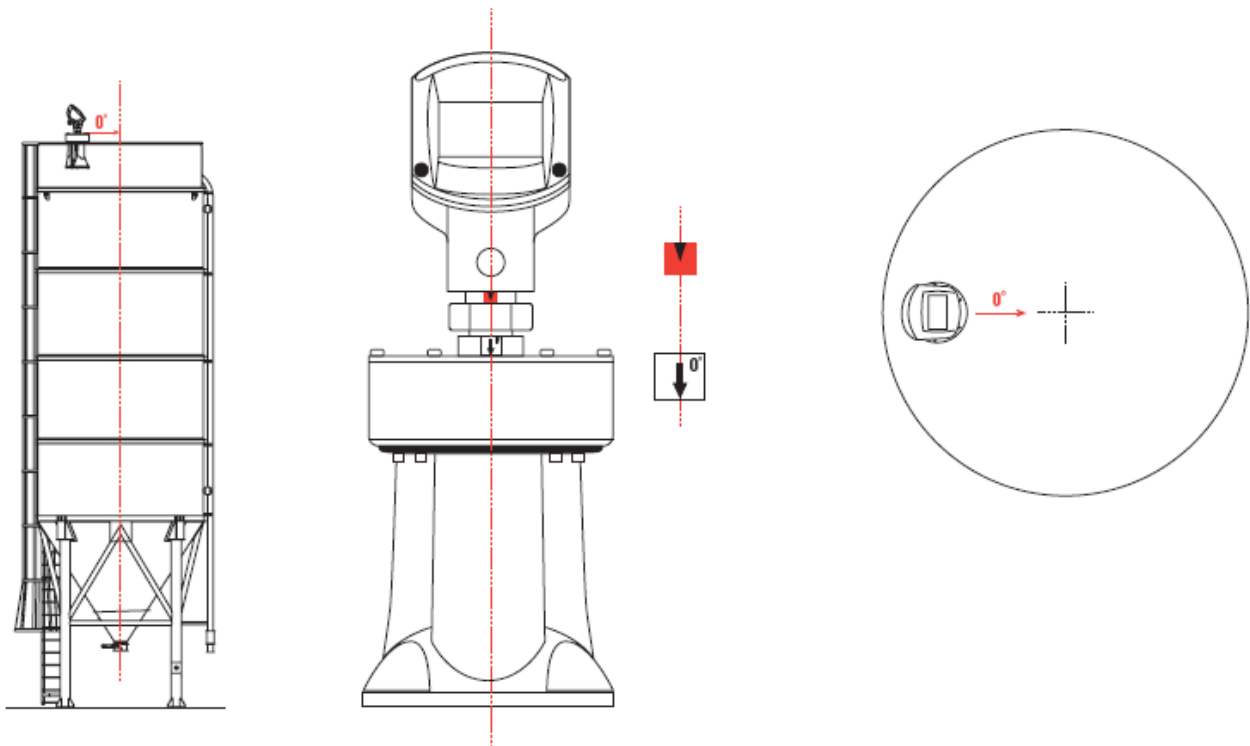


Figure 21 Mounting Direction



Although the mounting direction has no influence on version S of the 3DLevelScanner, it is recommended to mount it correctly to enable future upgrades to the M or MV versions (which require this mounting direction).



Connecting the Scanner Communications

An outer cable diameter of 5...9 mm ensures that the cable entry point is effectively sealed. If electromagnetic interference is expected, it is recommended to use screened cable for the signal lines.

To connect the scanner communications:

1. Loosen the four screws of the scanner rear panel on the back of the scanner head and remove the rear panel (see *Figure 12* on page 6). The screws are captive and will not fall off.
2. Loosen the compression nut of the cable entry point.

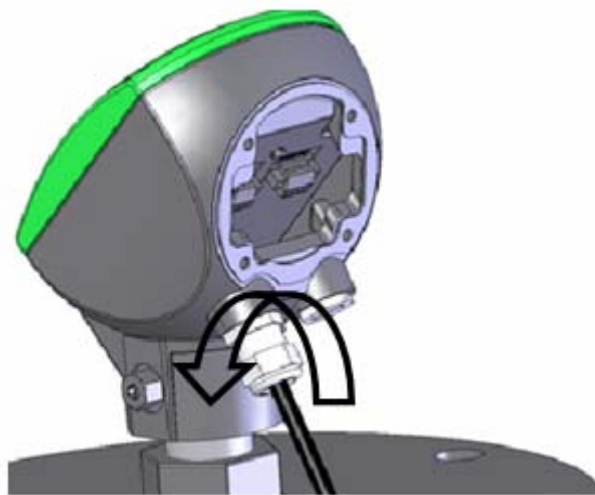


Figure 22 Loosening the Compression Nut

3. Remove approximately 10 cm (4 inch) of the cable mantle and strip approximately 1 cm (0.4 inch) of the insulation from the ends of the individual wires.

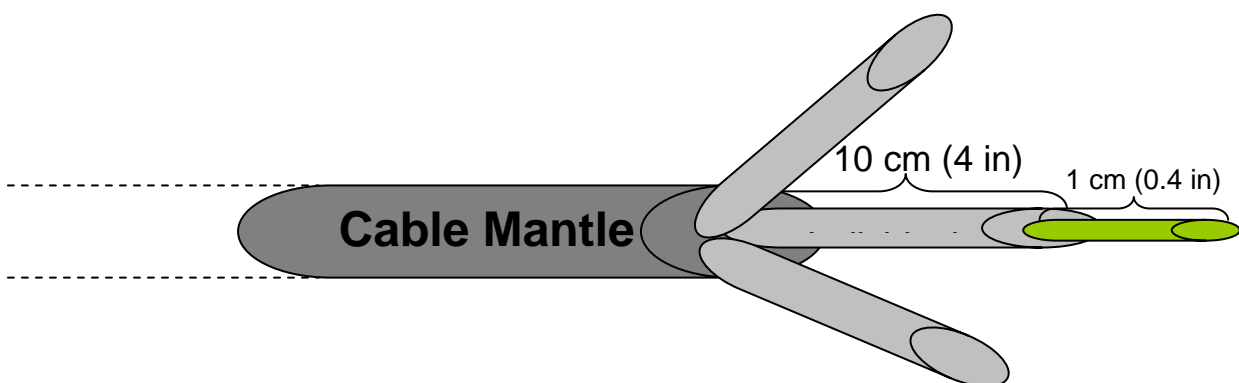


Figure 23 Preparing the Cable



4. Insert the cable into the scanner through the cable entry point.

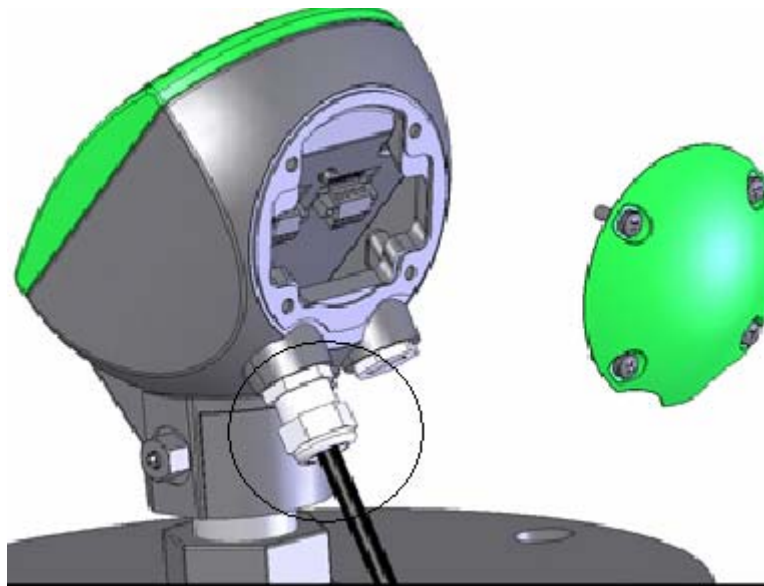


Figure 24 Inserting the Cable

5. Inside the rear of the scanner head, open the terminal screws using a screwdriver.
6. Insert the wire ends into the open terminals according to the wiring plan (see *Figure 26*), and fasten the terminal screws.

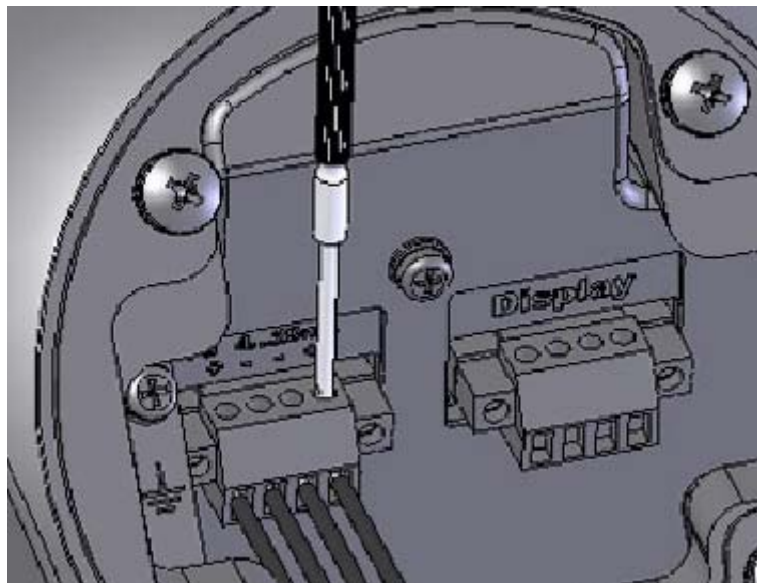


Figure 25 Connecting the Cable to the Terminals

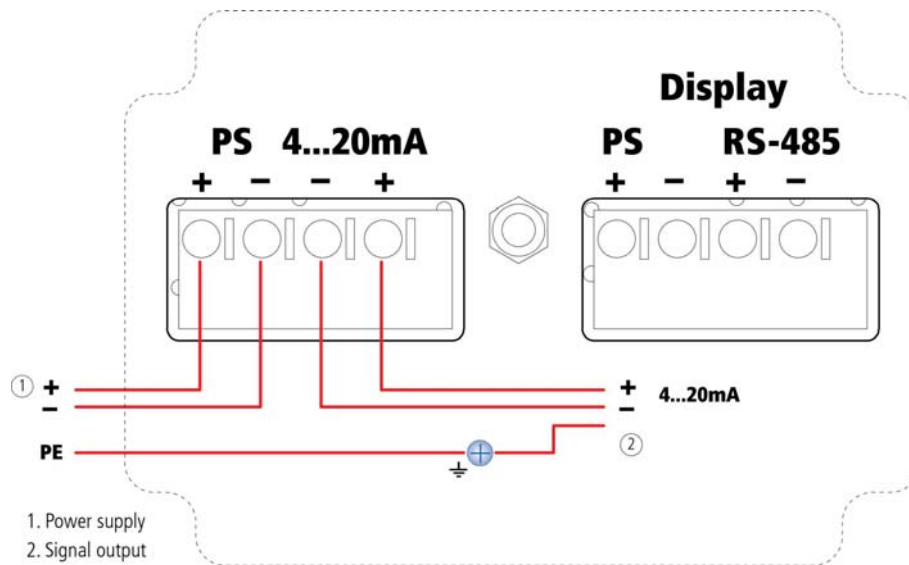


Figure 26 Wiring Plan (4...20 mA/Hart 4-wire)

7. Gently pull the wires to ensure that they are secured in the terminals.
8. Connect the screen to the external ground terminal for potential equalization.

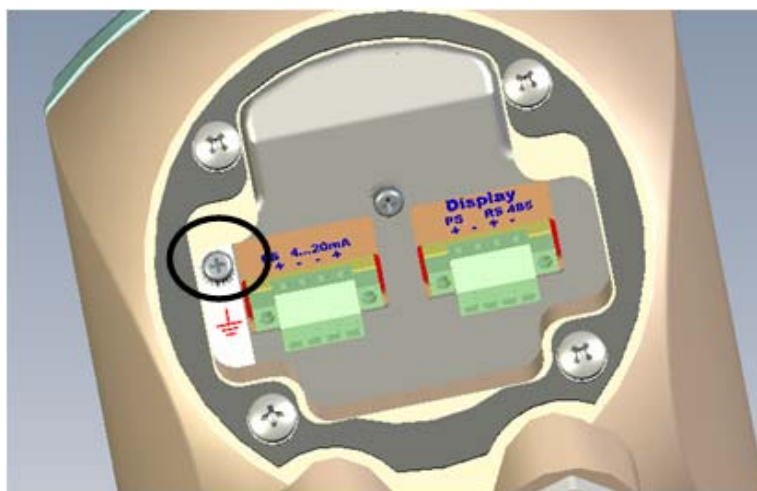


Figure 27 Ground Terminal

9. Tighten the compression nut of the cable entry point. The seal ring must completely wrap the cable.
10. Reinstall the rear panel onto the rear of the scanner head and tighten the four screws that secure it in place.

After mounting, and connecting power and data communication, the scanner is ready for configuration.



Configuring the Scanner

This chapter describes how to set up and operate the 3DLevelScanner.

Configuration Tools

You can set up and operate the 3DLevelScanner using one of the following:

- ① The LCD panel (see *Configuring with the LCD Panel* on page 18).
- ① An adjustment software tool (see *Configuring with the 3DLevel Manager* on page 20):
 - Via 3DLink Pro (through GSM/GPRS communication).
 - Via a HART modem.
 - Via a RS-485 connection.



Use the LCD panel option only for the 3DLevelScanner S version. The M/MV versions must be configured using the 3DLevel Manager only.



Configuring with the LCD Panel

Figure 28 shows the LCD panel. The adjustment keys are described in Table 1.

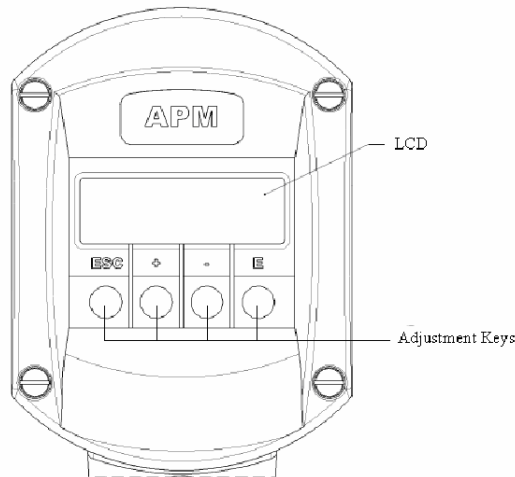




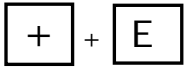
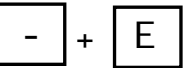


Figure 28 Scanner Front Panel LCD

Table 1 Adjustment Keys

Adjustment Key	Description
	This key enables you to: <ul style="list-style-type: none"> ⦿ Navigate downwards in the selection list. ⦿ Shift to the right within a function.
	This key enables you to: <ul style="list-style-type: none"> ⦿ Navigate upwards in the selection list. ⦿ Edit numeric values within a function.
	This key enables you to: <ul style="list-style-type: none"> ⦿ Navigate to the left within a function group. ⦿ Hold for 3 seconds to go back to the default screen.
	This key enables you to: <ul style="list-style-type: none"> ⦿ Navigate to the right within a function group. ⦿ Confirmation.
 Simultaneously	Increases the contrast of the LCD display.
 Simultaneously	Decreases the contrast of the LCD display.



To configure the scanner:

1. Press E to get to the main menu.
2. Scroll to the *Basic Settings* submenu (by default, this is the first submenu in the main menu screen).
3. In the *Basic Settings* submenu, set the Empty and Full Calibrations:
 - Empty calibration defines the 0% of material point.
 - Full calibration defines the 100% of material point.

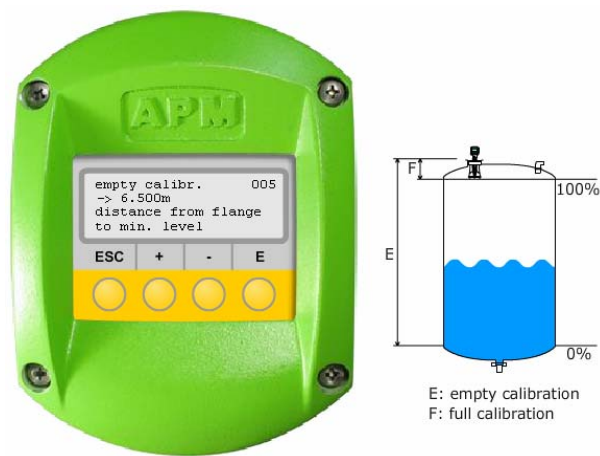


Figure 29 Setting the Empty and Full Calibration



Configuring with the 3DLevel Manager

To use the 3DLevel Manager, you must first connect the scanner to the computer and install the software.

Connecting the Scanner to the Computer

Connect the 3DLevelScanner to the computer that the 3DLevel Manager software will be installed on, as shown in *Figure 30*.

For detailed instructions about adjusting parameters using the 3DLevel Manager Software, refer to the *APM 3DLevel Manager Software Operating Instructions* manual.

Adjustments can also be made via RS485, or remotely by GSM/GPRS.

If connecting via a HART modem, ensure that the modem is installed correctly on the PC. If not, follow the installation instructions in the *APM 3DLevel Manager Software Operating Instructions* manual.

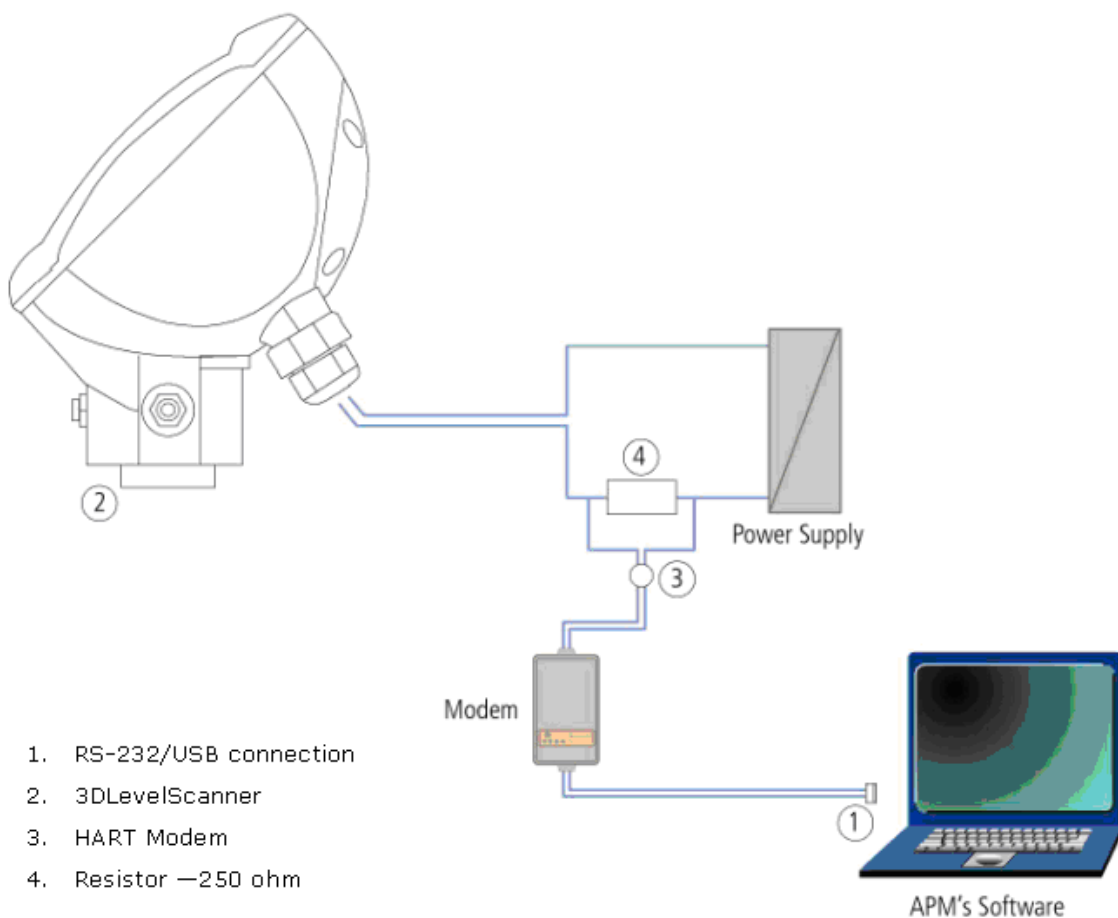


Figure 30 Connecting the Scanner to the Computer



Installing the Software

To install the software:

1. Ensure that no previous or other version of the APM Manager Software is installed on the PC. If an installation exists, uninstall it before proceeding with the new installation.
2. Insert the software CD into the PC/Laptop connected to the scanner.
3. The installation will start to run automatically. If not, browse to the CD folder and double-click *APM Level Scanner.msi* to start the installation.
4. Follow the instructions of the installation wizard. When installation is complete, the following icon is added on the desktop:



Figure 31 3DLevel Manager Icon

Manually Connecting to the Scanner

If the scanner is connected locally via a HART modem, the connection between the computer and the scanner should be established automatically.

If the scanner is connected via RS485/GSM/GPRS, or automatic connection was not successful, you must manually connect to the scanner.

To manually connect to the scanner:

1. Double-click the 3DLevel Manager icon. The 3DLevel Manager is displayed.
2. From the 3DLevel Manager menu, select **Device > Manually Connect**.
3. Select the relevant connection type and port number.
When connection is established, a green light appears in the right pane of the application.

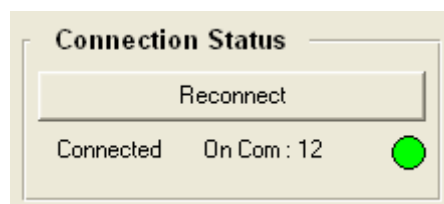


Figure 32 Connection Established Indicator



Configuring the Scanner

To configure the scanner:

1. Double-click the 3DLevel Manager icon. The 3DLevel Manager is displayed.
2. Perform the following to define the linearization settings:
 - a. Select the **Linearization** tab. The Linearization tab is displayed.

Point #	Level (m)	Volume (%)
1	0.000	0.000
2	0.167	0.032
3	0.333	0.075
4	0.500	0.128
5	0.667	0.194
6	0.833	0.274
7	1.000	0.369

Figure 33 Linearization Tab

- b. From the Linearization drop-down list, select **Custom**.
- c. From the Customer Unit drop-down list, select the required type of unit:
 - % - percentage.
 - **m³** - cubic meter.
 - L - liters.
 - **ton** - tons.



If you select **ton**, you must also enter a value in the Density field.

- d. Click **Silo Parameters**. The Silo Control Properties window is displayed.

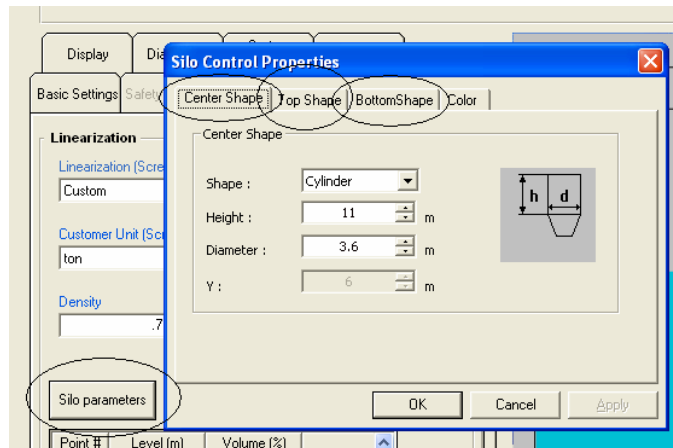


Figure 34 Silo Control Properties Window

- e. Click each of the following tabs and define the vessel parameters:
 - Center Shape.
 - Top Shape.
 - Bottom Shape.
- f. Click **Upload Linearization and Basic Settings to the Scanner** (see *Figure 33*).
3. Perform the following to define the basic settings:
 - a. Select the **Basic Settings** tab. The Basic Settings tab is displayed

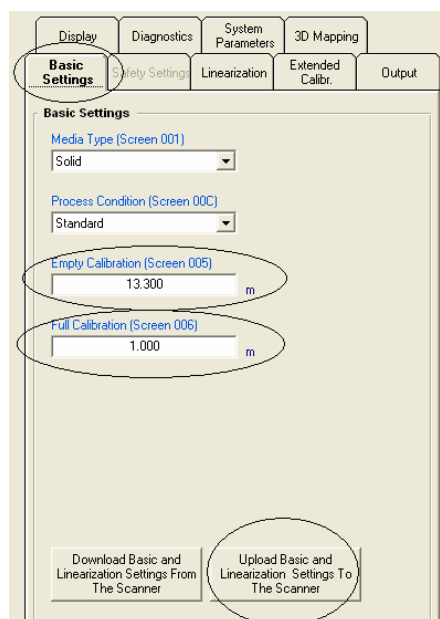


Figure 35 Basic Settings Tab

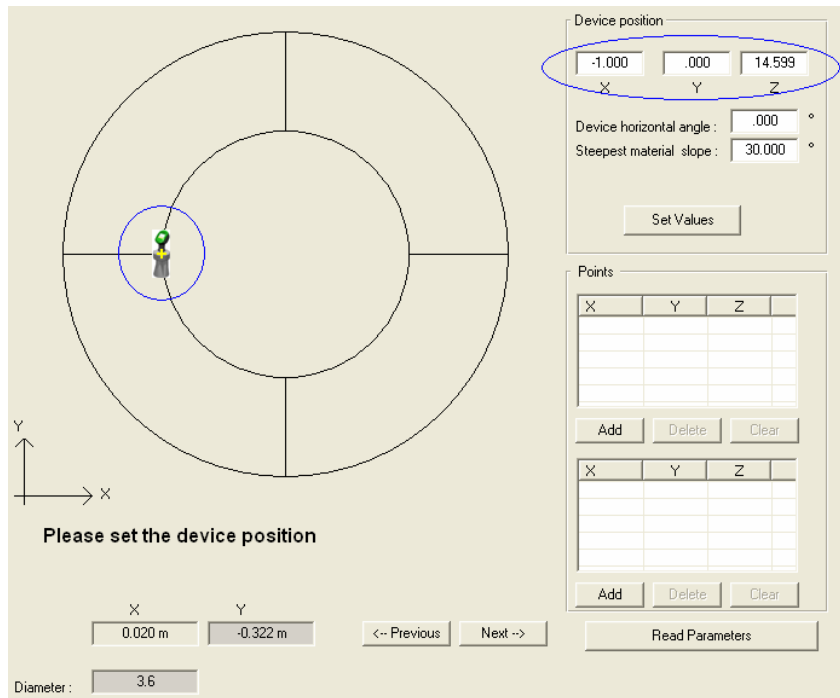


Figure 37 Set Device Position Window

- c. Drag and drop the image of the device on screen to the position where the device is located in (X, Y, Z) coordinates. Alternatively, enter the coordinates in the Device position (X, Y, and Z) fields.
- d. In the Steepest material slope field, enter the steepest material slope (usually 20–40°).
- e. Click **Next**. The Set Device View Point window is displayed.

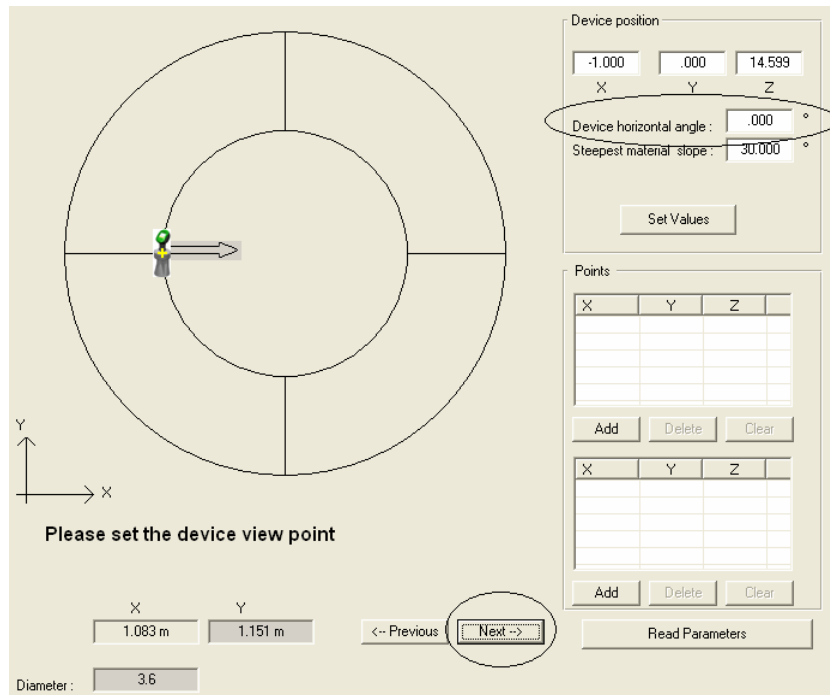


Figure 38 Set Device View Point Window

- f. Drag and drop the arrow of the image to point in the direction of the 0^0 mounting direction of the device. Alternatively, enter the coordinates in the Device horizontal angle field.
- g. Click **Next**. The Set Filling Points window is displayed.

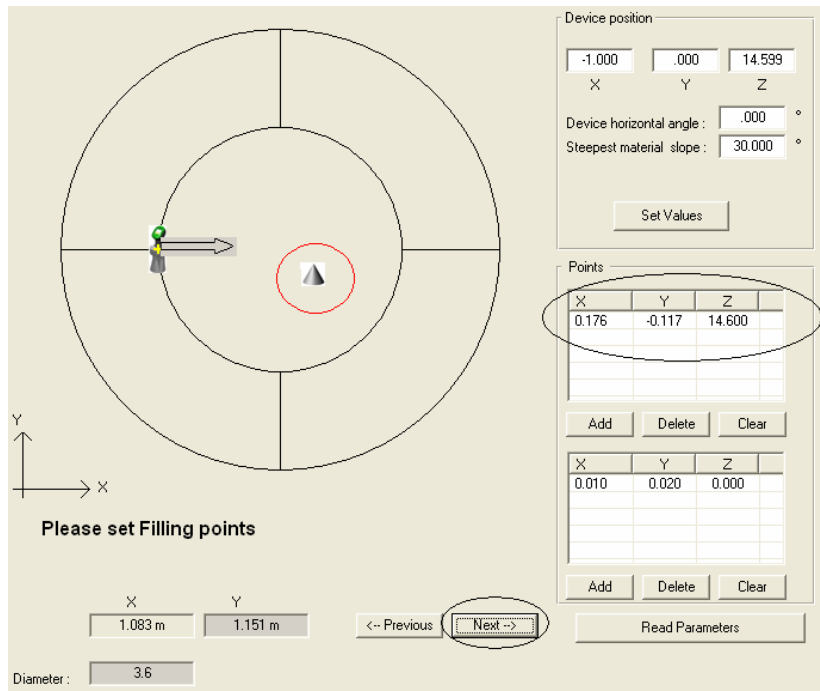


Figure 39 Set Filling Points Window

- h. Click the position in the vessel's image where the filling point is located.
- i. Click **Next**. The Set Emptying Points window is displayed.

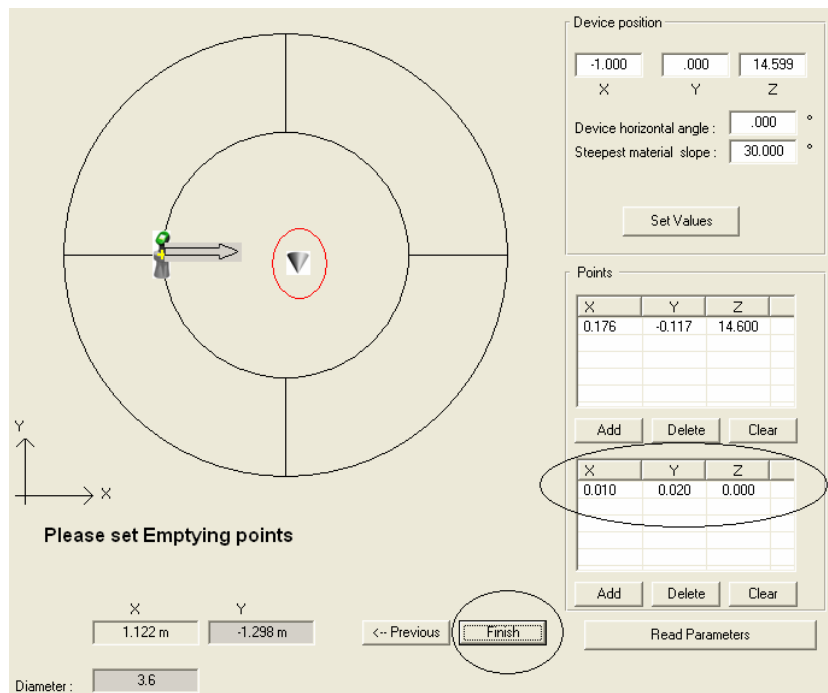


Figure 40 Set Emptying Points Window



- j. Click the position in the vessel's image where the emptying point is located.
 - k. Click **Finish**. The Set Emptying Points window closes. (If the window does not close automatically, close the window.)
5. Perform the following to define the extended calibration parameters:
- a. Select the **Extended Calibr** tab. The Extended Calibr tab is displayed

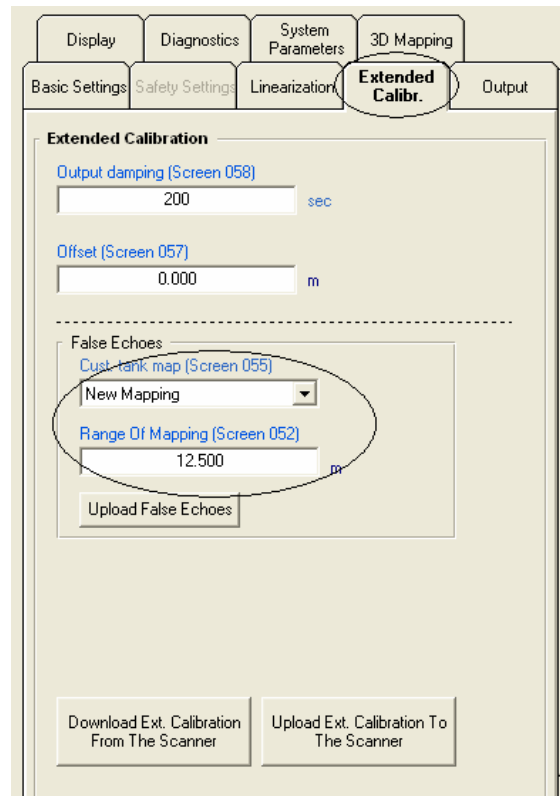


Figure 41 Extended Calibr Tab

- b. In the Output damping field, enter the damping value as follows:
 - For S version – at least 45 seconds.
 - For M/MV version – 200 seconds.
- c. From the Cust tank map drop-down list, select **New Mapping**.
- d. In the Range Of Mapping field, insert the true distance of one meter above the material. Check the distance with a laser or a weight measure to ensure that the estimate is accurate. For example, if the average true distance is about 13.5 meters, enter 12.5 meters in the Range Of Mapping field.



- e. Click **Upload False Echoes**. The value in the Range Of Mapping field is replaced with the message “Calculating” for approximately 2-3 minutes (depending on the value of the distance entered). When the false echoes upload is complete, the value in the Range Of Mapping field returns to the value you entered.

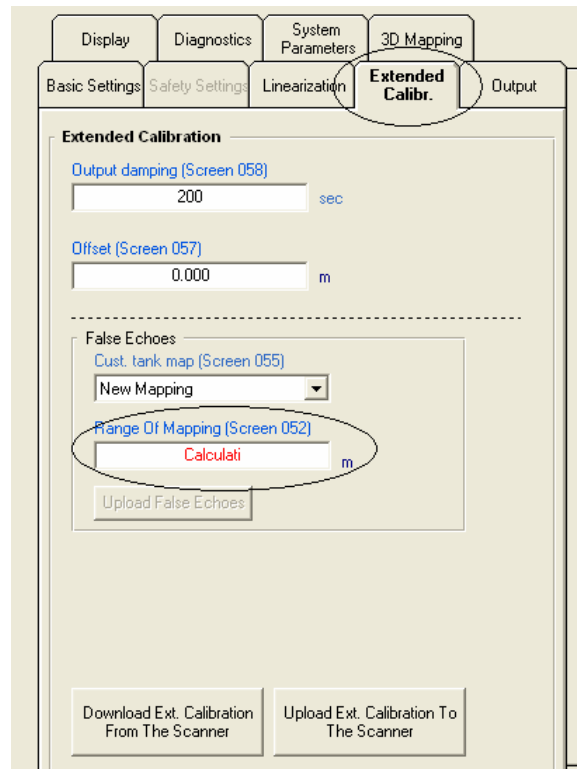


Figure 42 Range Of Mapping Calculation Message

The 3DLevelScanner is now ready to use. For more information about advanced configuration options, refer to the *APM 3DLevel Manager Software Operating Instructions* manual.



Recommended Tools and Materials

Table 2 lists the tools for installing the APM 3DLevelScanner S/M/MV.

Table 2 Recommended Tools and Materials

Description
The site application documents, including the Silo drawing.
Large Phillips screwdriver (2x100).
Medium Phillips screwdriver (1x100).
Set of small precision screwdrivers (for the green connectors).
13" wrench.
16" wrench.
Allen Key 4 (preferably with a handle).
Large adjustable wrench 18".
Stanley knife.
Cutter.
Pointed pliers.
Insulating tape.
* Laser measurement device (or other device to ensure correct positioning and distance to the material).
Laptop.
USB HART modem.
Software drivers for the HART modem.
238 Ohm resistors.

* - This device is required to measure the true distance from the flange to the material during the installation, and for the false echoes mapping process.

QUICK INSTALLATION GUIDE

You can find at

www.apm-solutions.com

downloads of the following:

- **Brochures**
- **Data Sheets**
- **Operating instructions manuals**
- **Software**
- **Certificates**
- **Product information**

and much, much more



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