



Incremental Digital Extensometer



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Incremental Digital Extensometer



WARNINGS



This instrument must be utilized only for the application it has been designed for.
OTR declines all responsibility for any improper use.



Do not let this instrument fall into the hole quickly.



Do not put this instrument in flammable liquids or potentially explosive gases.



Do not use this instrument in water where an electric dissipation is in progress



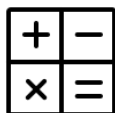
Do not let the cable slide quickly in your hands. Use protective gloves.

Furthermore

- Do not open this instrument, contact the manufacturer for checks and repairs;
- Keep out of reach of children;
- When recharging, insert protective caps on sensor and connectors;
- When recharging, do not touch the roll with wet hands;
- Do not recharge for more than 12 Hours;
- Use only original power supply unit to recharge the instrument;
- Clean this instrument and its cable with alcohol or water, do not use acetone or aggressive liquids for plastics or labels;
- Don't close or stop the application OG311DX while it's measuring

NOTES

Extensimetric measurements, despite the simplicity, needs a minimal preparation. Follow next suggestion:



Be aware of the type of calculation performed by the program



It is necessary to have correct angle for slide 1 to obtain charts and results with a correct direction



Have a laboratory ore-test before the worksite measurements.



Charge the roll, avoid to completely discharge batteries.



Always use the test probe supplied, particularly in the case of excessively deformed inclinometers in order to avoid foreseeable risks to the instrument



After usage in sea water clean the bearings.



If connector is wet, let it dry up before covering it with its protection caps.



Do not drag the connector



Do not utilize spray or oil on the connectors.



Do not utilize instrument where temperature is more than 50-60 °C. In this case take measures with circling water.

NOTES



O-rings do not need maintenance.



Do not close app during measurements.

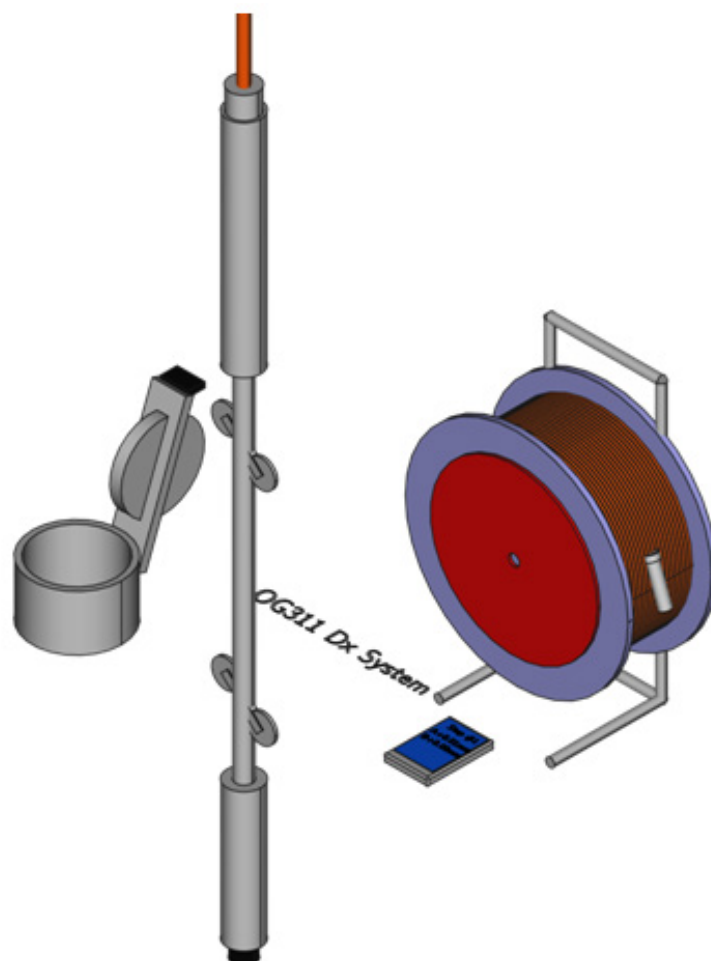


The product is tested, calibrated and guaranteed only with original OTR accessories.

Applications

- Extensimetric system OG311DX has been designed to execute measurements in extensimetric casings installed underground. Instrument, with differential measurements, can identify and quantify underground movements using differential measurements.

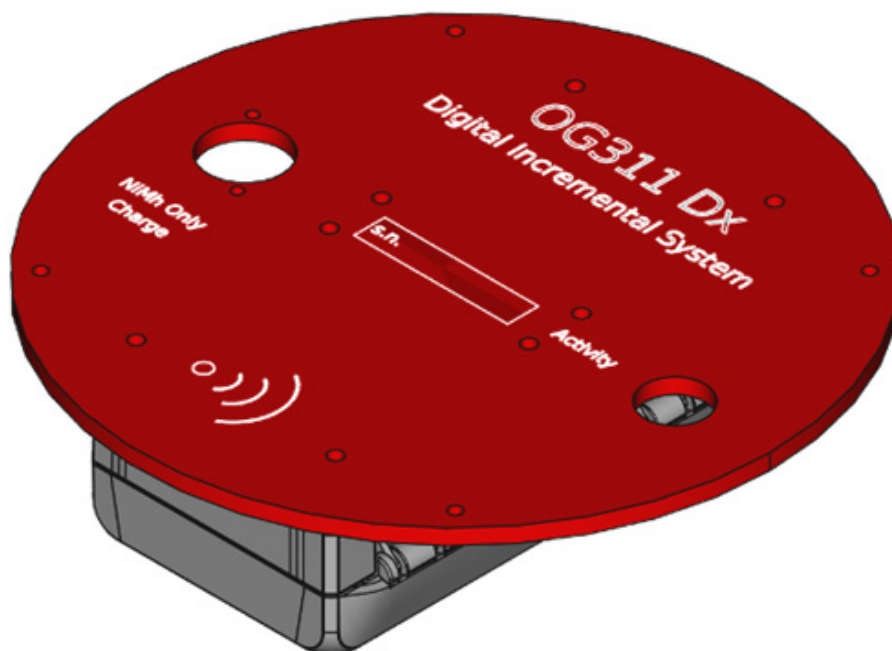
Description



System is composed by:

- Extensimetric probe, 1000 mm or 32";
- Extensimetric cable and roll with 500 mm or 24" step;
- Pulley and extension;
- Rugged Mobile Bluetooth;
- Dummy probe on roll;
- Boxes and accessories;

Frontal Pannel



On/Off Activity Led

- Led Off: System is completely off;
- Led Blinking: Roll is waiting for connection;
- Led On: Roll is connected to rugged mobile.

Battery Charger

- Plug for the provided battery charger.

Nota bene

- Connector has a rubber cap that must be keep closed during measurements;
- It is not possible to charge instrument and make measurements at the same time;
- Use just the provided battery charger.

Identification

Every extensimetric system is identified by:

- Serial number of inclinometric probe;
- Serial number of roll and cable;
- Serial number of PDA, Rugged Mobile;

Calibration parameters are stored onboard each probe. This makes rolls and probes interchangeable. It is recommended anyway to take measures with the same cable, probe and roll combination, when possible.



Installation

Instrument can be correctly positioned following one of these equivalent rules:

- Placing the first cable notch at the beginning of the tube;
- Placing the second cable notch on the pulley cleats (when using pulley and extension)

Measures can be executed:

- From the top lowering the probe at every step ;
- From the bottom, lifting the probe at every step..

Before starting a measure it is recommended to use a dummy probe. If external temperature is higher than usual, increase thermal stabilization time.

In order to obtain better results, probe wheels should be positioned at the same pipe depth when acquiring corresponding steps in different slides and in different measurements. Measures executed with different cable positioning could not be satisfactory.

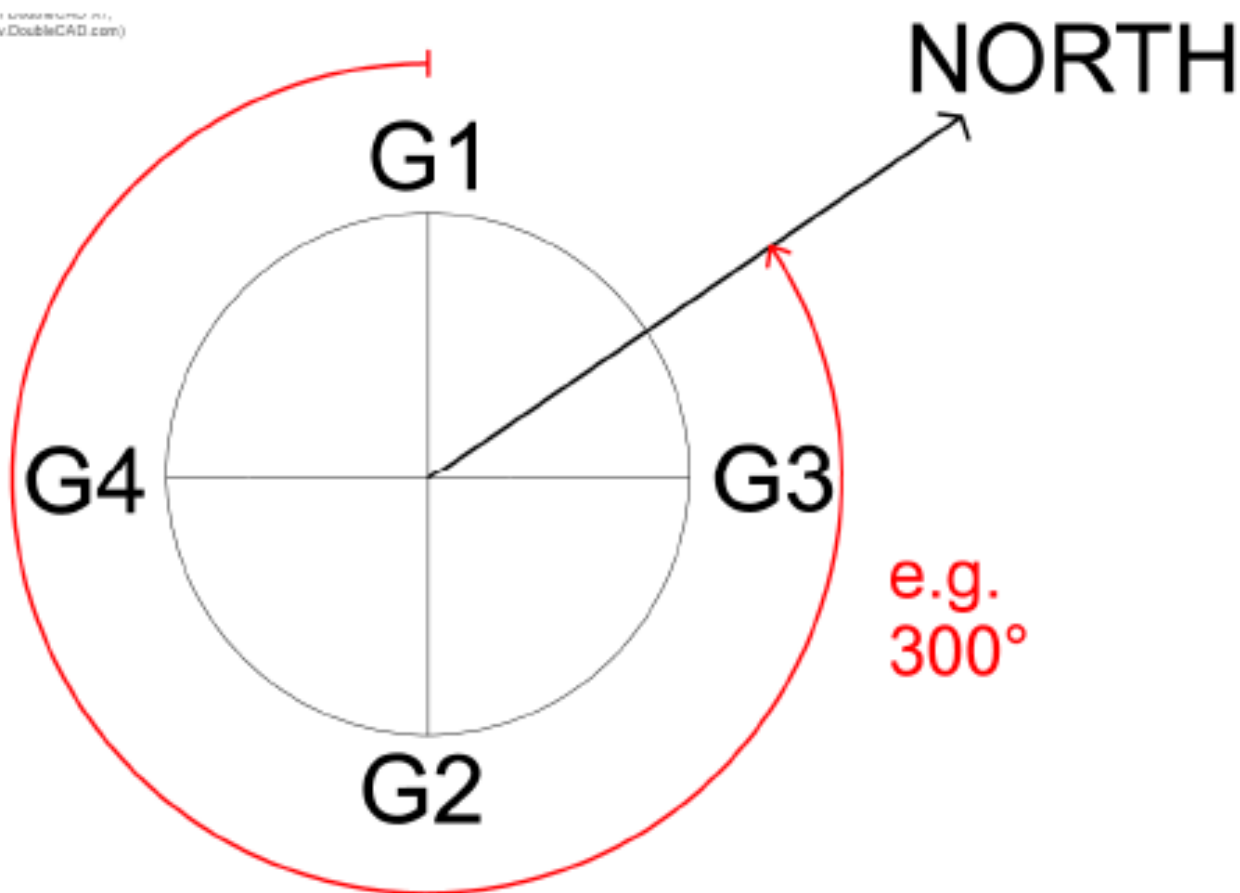
Distance between first notch and high wheel pin in O.T.R. systems is 500 mm. Distance between first notch and low wheel pin in O.T.R. systems is 1000 mm. This scheme complies with the polygonal calculation of an inclinometer measurement.



Selecting slide 1

Proceed in the following way:

1. Select slide 1 and mark it with paint or any other durable way;
2. Identify the angle as follows:



Sequence of measures

Inclinometric measures must follow this simple rules to be compatible with OTR extensimetric software conventions:

Slide 1:

- High wheel in the Slide 1. Measures must be executed from top to bottom or from bottom to top with 500 mm steps.

Slide 2:

- High wheel must be inserted in Slide 2 (180° rotation, compared to how the probe was previously insterted in Slide 1).

Slide 3: (if needed)

- High wheel must be inserted in Slide 3 (90° anticlockwise rotation, compared to how the probe was previously insterted in Slide 2)

Slide 4: (if needed)

- High wheel must be inserted in Slide 4 (180° rotation, compared to how the probe was previously insterted in Slide 2).



If only 2 slides are measured, they must be at opposite directions (180°). It is not useful to take a single slide measure or a measure with 2 slides at 90°.
An origin set should always have 4 slides. 4 slides are recommended for a not expert operator



When measure is finished and the probe is disconnected, it is recommended to protect the connector during cable winding. Do not leave the connector rub on the floor.

Taking Measurements

1. Turn on your inclinometric probe pushing the button on the inclinometric roll.
After a few seconds the button will blink.
2. Open OTR OG311DX app installed on Android device.



For every measurement step will be memorized three values: A (High), B (Low) and D (Distance). B detect the placement of the lower magnetic ring, readout by the lower sensor of the probe. It's used to place the instrument and his value has to be near 0; channel A read high magnetic ring's placement compared to the higher sensor of the probe. D measure, highlights how much of the rings' placement departs from 1m.

3. Open Settings to establish a Bluetooth connection with your probe.



Inclinometric Probe ID is always in the format OG311DX SNxxx, where OG311DX is the model and SNxxx is probe serial number.

A blue dot next to probe ID indicates that connection between Android device and probe is correctly established.

When connection between Android device and probe is established, the button placed on inclinometric roll will stop blinking.

4. Exit Settings by pressing OTR icon at the top left corner of the screen.

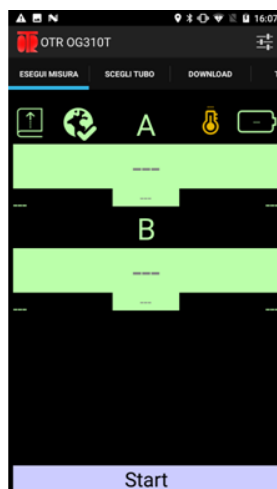
In case you have not selected yet any pipe for the next measure, the warning "Select zone/pipe" will appear.



5. Select zone and pipe for the next measure, tapping on ChoosePipe tab.



6. Select the pipe for the next extensimetric measure.
When pipe is selected, tab Take Measure will open.



7. Tap on battery icon to check probe battery and on thermometer to check its temperature
If probe battery value is low, a warning will appear at the beginning of next inclinometric acquisition.

8. Long press on map save current GPS coordinates for current pipe.
Confirm operation to save. If GPS coordinates are available, a message in the lower half of the screen will appear to notify coordinates saving, and a check mark will appear on map icon

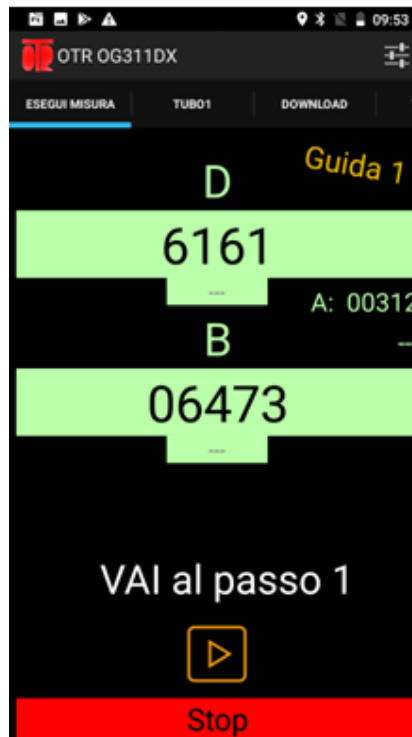
A short tap on map icon will open maps app to navigate you to selected pipe.

9. Tap on book icon to load an old acquisition into memory.
This function is optional. Use it in case you want to compare values of each step you acquire to value of corresponding step of a previous acquisition you took in the same pipe.

10. Tap on Start to start acquisition.
Start changes colour and shows a waiting advertising. Wait some seconds till the disappearance of the channels' A, B and D values. The application shows continuously on the screen probe's value and acquire it only after Play/ACQ button is pressed. Respectively Authomatical or Manual reading.

Automatic Acquisition

1. Tap on Play button



As soon as probe reads stable values, first step is acquired.

2. Move probe to the next acquisition step
As soon as probe stabilizes again, next step is acquired..
3. Proceed until you get to the last step of current slide
4. Once you acquire last step of current slide, tap on the Forward button to stop automatic acquisitions and shift to next slide.
In order to go back to the previous slide, tap on Back button instead. If you restart acquisition of a previously acquired slide, all steps of that slide will be erased from memory in order to allow new steps acquisition
5. Tap on Play button to start automatic acquisition on the new slide.

Manual Acquisition

1. Once automatic acquisition is started, tap on Pause to switch to manual acquisition mode.

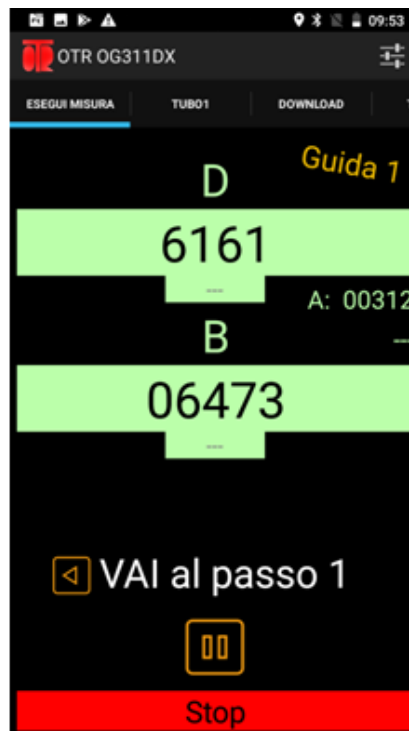


2. Tap on ACQ to acquire a new step.
Once the current step is acquired, you will be taken to the next acquisition step. To overwrite the last saved step, tap on "Back to step". To erase more steps, tap on "Back to step" multiple times until you get to the step you need.
3. Tap on Play button to switch back to automatic acquisition.

Note:

If the application is suspended during an acquisition, when it's restored the acquisition shift automatically in manual mood. Press Play to get back on Automatic mood.

Measure window



Channels' A,B and D values are continuously updated on the screen. When you are next to center with B channel, on the left of the screen appears positioning arrows that helps the user to center the probe: centering arrows when B channel shows a lower value than the centering threshold.

Upward arrows ask the user to raise the instrument inside the case; downward arrows ask the user to lower the probe inside the case.

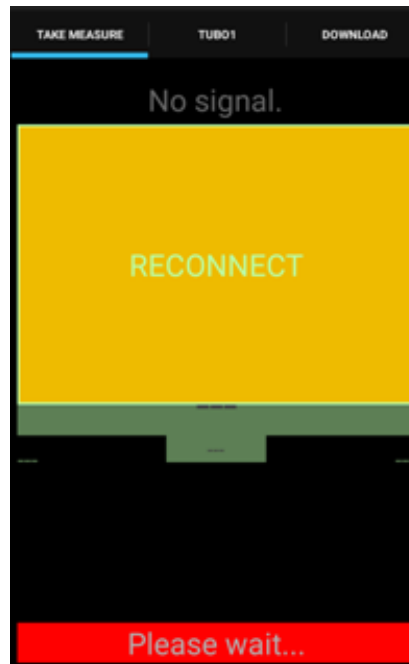
An acoustic signal alerts when the user is perfectly placed and the measure is kept.

At every acquired step:

- Acquired values of the B and D channels remain displayed in center of the screen in lower dimension till the next step acquisition
- If it was kept a previous acquisition, it's showed on the right side of the screen D value acquired during the last extensometer's measure, compared to the just performed step, for a quick comparison.
- The previous values acquired are indicated with "ex":
- It's showed the next step number to acquire:
- Exemple: "Goes to 3 step"
- On the left of the next acquiring step , a button allows to get one step back to cancel the last step acquired or to acquire it a second time.
- At the end of the extensometric measurement:
- press Stop and confirm the operation.

Wait some second to save the file. If you won't Stop, the compleat measure file isn't saved.

It may happen that Bluetooth connection between Android device and inclinometric probe gets temporarily down while an inclinometric measure is under way. In this case, a warning appears on screen.



If connection is not automatically restored after a few seconds, please tap the warning message to restore connection, without stopping inclinometric acquisition.

After tapping, please wait for about 20 seconds until Bluetooth connection is restored.

If necessary, press the warning button again and wait for further 20 seconds. In case you can not restore connection repeatedly, turn off and on the inclinometric roll without stopping inclinometric acquisition. Wait for a few seconds until power button on roll panel stops blinking and tap again on the warning button.

Bluetooth Connection

Bluetooth connections are used to establish communication between your Android device and inclinometric probe, or between your Android device and your PC.

Bluetooth connection between Android device and probe is necessary to acquire new inclinometric data; connection between Android device and PC is necessary to export acquired data to OG311Dx software on your PC. You can not be connected to probe and PC at the same time.

Do not close or suspend OG311Dx app while Bluetooth connection is active.

Do not use your Android device to place or receive calls while taking inclinometric measures.

- Setting a Bluetooth connection between Android device and inclinometric probe

1. Tap Settings icon at the top right corner of the screen
The following form will open.



2. Select OG311DX probe from the list of paired BlueTooth devices.
Extensimetric probe ID has the following format: model (OG311DX), followed by Serial Number (in the picture above SN373)

3. Verify that Bluetooth connection between Android device and probe is active: a blue dot will appear next to selected BlueTooth device in the app, and the power button on the inclinometric probe will stop blinking.

In case you can not immediately establish a BlueTooth connection to your probe, please wait for a few seconds and tap again on the probe name in the list. If again you can not establish a connection, please try and come closer to the roll and tap again. You might also turn off and on your inclinometric roll before tapping on the device name in the list.

4. Tap on the OTR red icon at the top left corner of the screen, to go back to the Measure tab.

The "Probe disconnected" warning will not be present any more. A new warning reading "Select Zone/Pipe" will be shown instead. Tap on the Choose Pipe Tab to select the pipe you are going to measure. For further details please refer to chapter Taking an inclinometric measure.



Setting a Bluetooth connection between Android device and PC.

Bluetooth connection between Android device and PC is needed in order to send acquired data to OG390WIN software.

Android device and PC need to be paired, before establishing a Bluetooth connection for the first time.

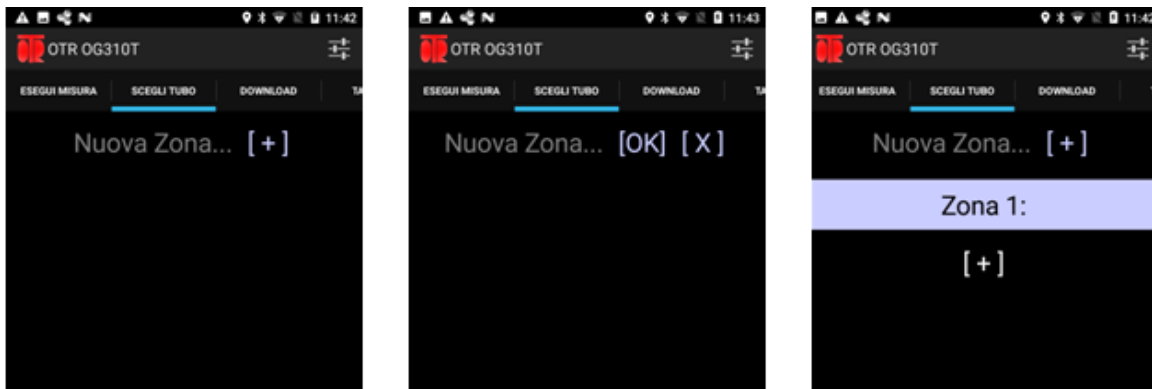
Following procedure is based on Windows10.

Create Zones and Pipes on Android device

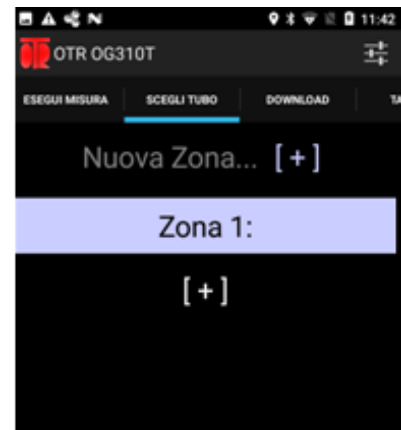
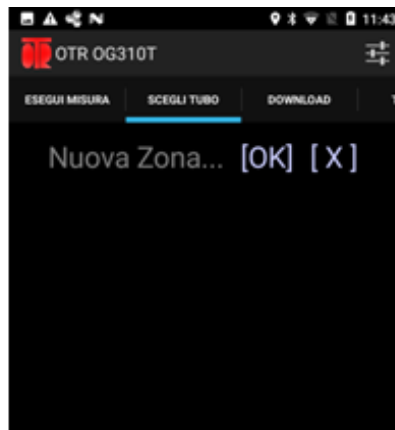
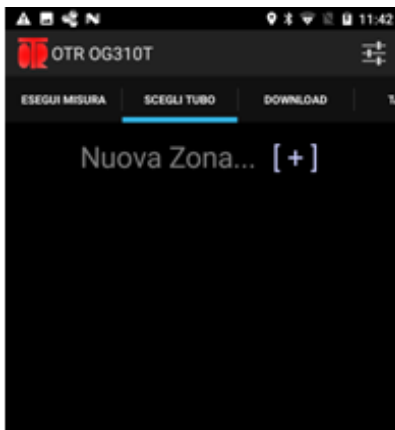
Zones and Pipes can be created in the app, tapping on the CHOOSE PIPE tab

1. To create a new Zone: tap on [+] next to New Zone. Tap on New Zone Name and a keyboard will allow you to enter the name for your new Zone.

Confirm with a tap on [OK] or cancel with [X]



2. To create a new Pipe: tap on [+] in a Zone. Tap on New Pipe name and a keyboard will allow you to enter the name for your new Pipe. Confirm with a tap on [OK] or cancel with [X]



3. To delete a new Pipe: Lon press on Pipe's name. You can not delete pipes containing inclinometric files. Only unse piped can be deleted..
4. To delete a new Zone: Lon press on Zone's name. You can not delete zones containing pipes. Only empty zones can be deleted.

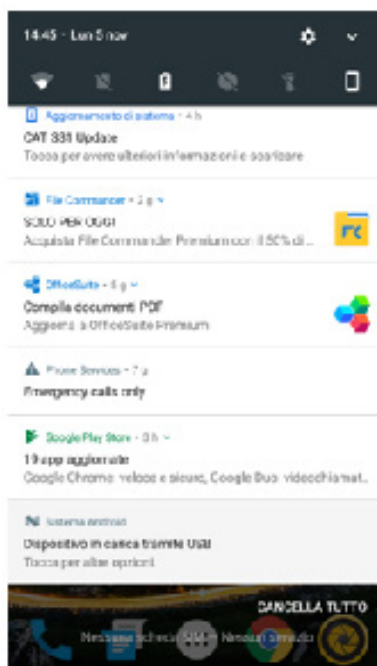
Manage Zones and Pipes from your

1. Connect Android device to PC with USB cable. USB connection to PC allows battery recharge as default option.
2. Enable USB file transfers on your Android device. To enable file transfer to PC via USB connection::
 - Unlock your Android device

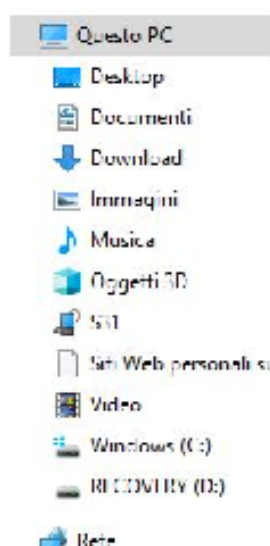
- Swipe down from the top of the screen to show Android notifications.



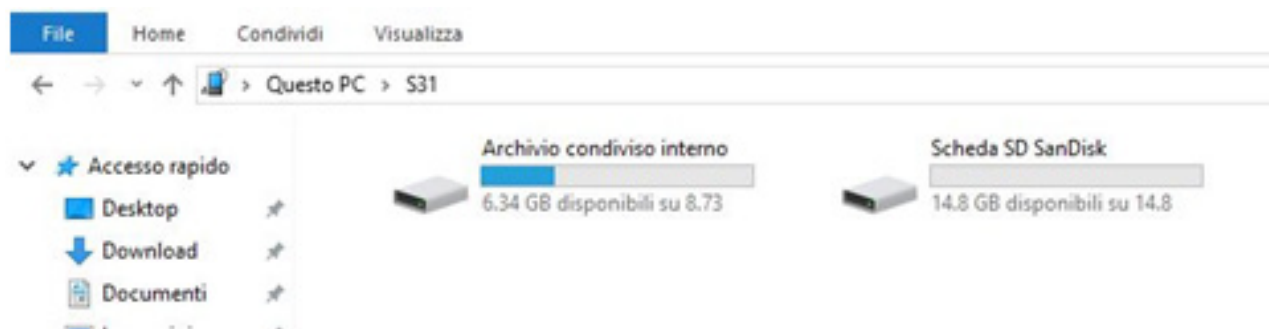
- View the notifications
- Select Charging Device



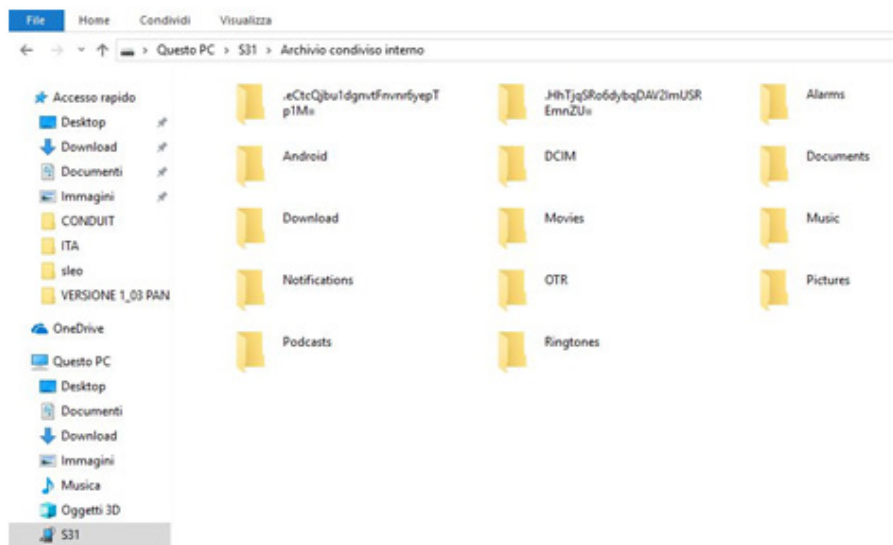
3. On your PC, browse to This PC and open your Android folder (S31)



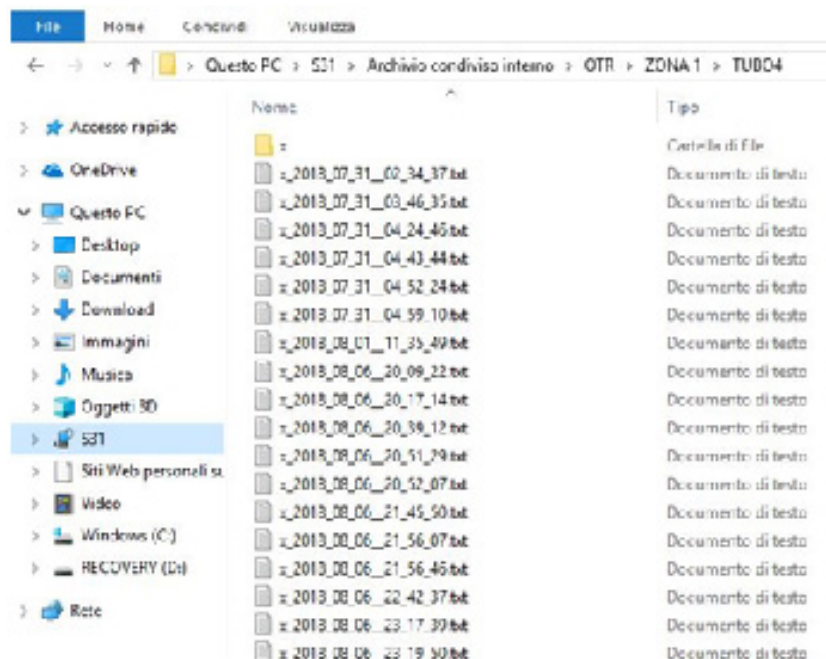
Android device S31 is listed in computer folders



4. Open OTR folder in device internal shared storage.

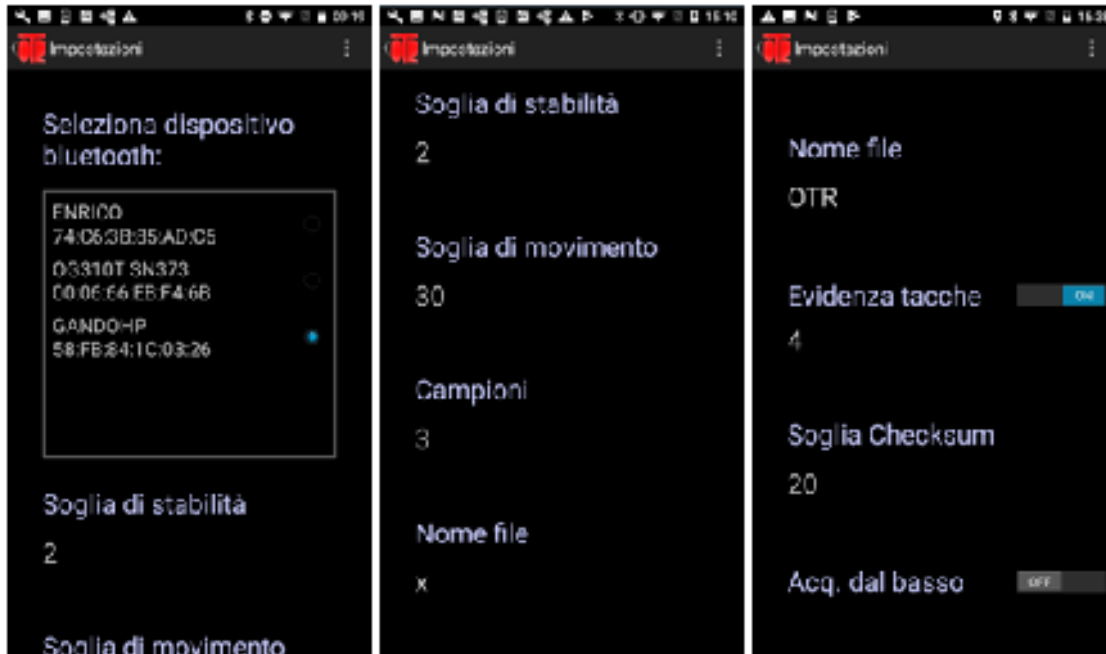


5. In OTR folder, create a new folder for each Zone you want to list in the app.
6. In any new Zone folder, create a Pipe subfolder for each Pipe you need in that Zone. Inclinoetric measures will be saved in these Pipes subfolders.



Files' names are composed by a prefix (settable by Options), followed by data and time of the file creation. The prefix should coincide with the name of the operator which is entraste with the Android handheld.

OG311DX app Settings



In the Settings screen are listed the following settings:

- Select Bluetooth Device

List of Bluetooth devices paired to Android device.

In this list you can find one or more inclinometric probes, each one identifiable by its Serial Number, and one or more PCs for data download.

This is a read-only list.

For further details about how pairing Bluetooth devices, please refer to chapter Bluetooth Connection.

- Stability Threshold

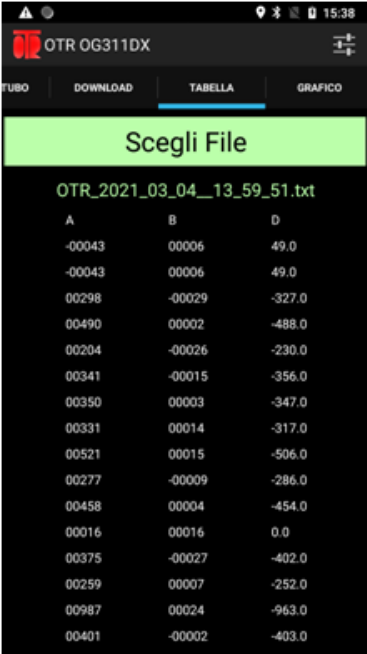
Variation threshold for channels A and B, below which probe is considered stabilized during automatic acquisition.

Default value: 2

In case inclinometric pipe is poorly embedded in concrete, probe might not get stabilized due to undesired small pipe vibrations. It might be necessary to increase stability threshold value, or switch to manual acquisition mode.

- **Movement Threshold**
Variation threshold for channels A and B, above which probe is considered voluntarily moved between two steps of measures, during automatic acquisition.
Default value: 30
- **Samples**
Number of samples used to evaluate probe stabilization
Default value: 3
- **File name**
Prefix for saved files.
Default value: OTR
Prefix can be useful, in case you have more inclinometric systems or more Android devices, to identify measures acquired by different operators.
- **Highlight notches**
Activates/disactivates sound effect and visual notification for acquisition of colored notch steps.
Enter number of first colored notch on your inclinometric cable
Default value: Off
- **Checksum Threshold**
Threshold for checksums when loading file in Table view.
Checksum average is computed for each acquired slide. Steps are highlighted whenever their own checksum differs from slide average more than this threshold.
Default value: 40
- **Acq. from bottom**
Steps acquisitions order. Select ON in case you acquire steps from bottom up. Select OFF in case you acquire steps from top.
Affects in-app charts visualization only.
Default value: Off

Data Grid



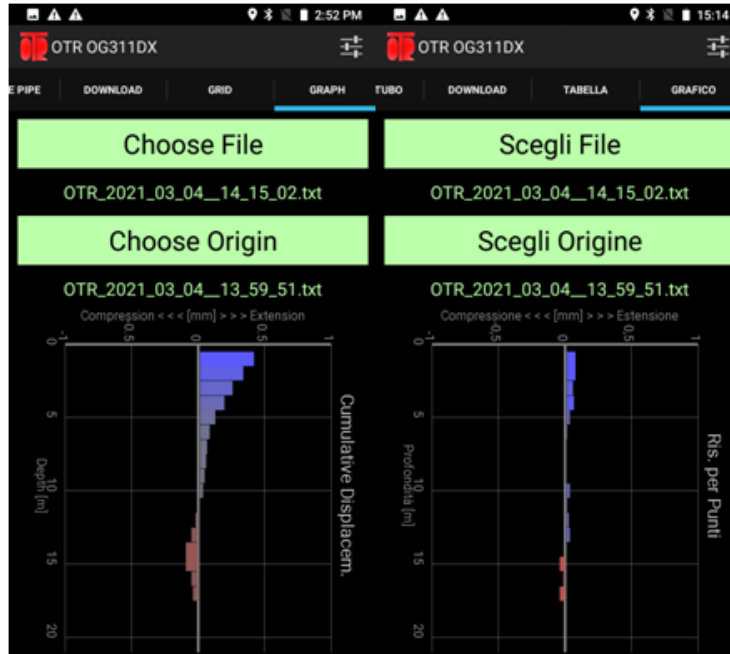
The screenshot shows the 'Scegli File' (Choose File) screen in the OTR OG311DX app. The file selected is 'OTR_2021_03_04_13_59_51.txt'. Below the file name is a table with three columns: A, B, and D. The table contains 18 rows of data, where the first two columns (A and B) represent step numbers and the third column (D) represents a value. The values in column D range from -488.0 to 49.0.

A	B	D
-00043	00006	49.0
-00043	00006	49.0
00298	-00029	-327.0
00490	00002	-488.0
00204	-00026	-230.0
00341	-00015	-356.0
00350	00003	-347.0
00331	00014	-317.0
00521	00015	-506.0
00277	-00009	-286.0
00458	00004	-454.0
00016	00016	0.0
00375	-00027	-402.0
00259	00007	-252.0
00987	00024	-963.0
00401	-00002	-403.0

1. Tap on Choose File button
2. Select file to load
3. Swipe down to check all steps.

Steps are checked as soon as they are loaded into table. Steps whose checksum differs from checksums average of their slide will be highlighted.. Threshold for checking checksum can be changed in app Settings. Please refer to previous chapter.

Charts



1. Tap on Choose File button
2. Select acquisition to show
3. Tap on Choose Origin button
4. Select origin file.
5. Tap on chart to change chart type

Charts are computed against selected origine measure .

In-app charts are indicative of quality of acquired measure.

Any compression measured (corresponding to D negative values) are left red highlights inside the graphic compared the vertical axis of the graphic.
Extensions measured (corresponding to D positive values) are right blue highlights inside the graphic compared to the vertical axis of the graphic.