Schleibinger eBT-V - Rheometer for fresh concrete

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1 Introduction

Congratulations! You have just purchased the concrete tester eBT-V a further development of eBT2. The concrete tester eBT-V is a rheometer for fresh concrete. This rheometer combines two types of concrete rheometers in one (Fig. 1). The unit can be operated in two different modes, which are called P-mode and V-mode. This allows to measure the rheological parameter of fresh self-consolidating concrete or of fresh very stiff concrete as well. This rheometer is portable, compact and net-independent which allows to use it not only in the lab but also direct on the building site. The eBT-V includes the following components:

1. The measuring system itself, a shaft decoder and two bending moment sensitive probes
2. Two rechargeable accu packs and a charging device
3. A measurement pot for the concrete sample, with a shaft to stick on the eBT-V for P-mode incl. protection sleeve for the shaft
4. shear bodies with a cylinder and spherical shape
5. A measurement pot with device holder for the concrete sample for V-mode
6. Vane cell, 4-blades
7. A smart phone with Android operating system controling the eBT-V over a Bluetooth interface, saving measured data and transferring them to a common PC.

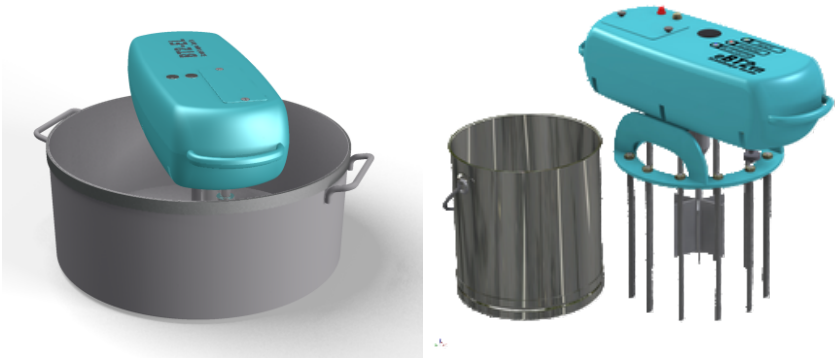


Figure 1: Concrete tester eBT-V in P-mode (left) and V-mode (right)

2 Theory of operation

2.1 P-Mode

The eBT-V measures the force on a shear body, which is moved through the concrete. The device rotates on a fixed shaft which is mounted in the center of the specimen container (Fig. 2). A maximum of one revolution (360°) is used to measure only in non-sheared concrete. The speed profile is freely programmable. The force on the shear body is measured as a function of the shear rate.

In a pot with a shaft centered and vertically positioned fresh concrete is filled. A probe for the P-mode is fixed on eBT-V. The eBT-V is sticked on the centered shaft of the pot horizontally. The measurement can be started. The data of the probe will process into a flow curve taking into account the different angular speeds and the distance of the centering rod. Also the stationary force at constant speed can be calculated. After the measurement the data sets are wireless transferred to a smart phone, there the measurement results can be graphical displayed and short term saved. From the smart phone an easy transfer to a PC for further analysis is possible.

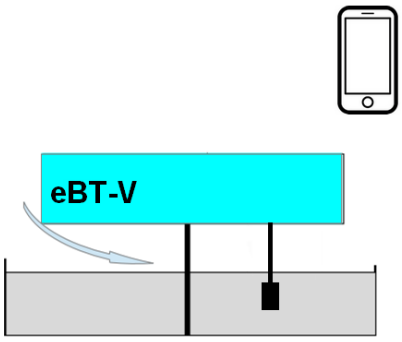


Figure 2: Theory of operation - P-mode

By the operating the rheometer in P-mode the fresh concrete properties can be investigated due to one single revolution in non-sheared concrete. As a result, possible problems such as segregation and structural breakage during the measurement are greatly minimized. The measurement time is usually less then 1 minute.

2.2 V-Mode

In V-mode the Vane-geometry is using as an approximation of a classical cylinder geometry. The eBT-V is fixed on the device holder. The Vane probe, also known as a star or wing cell, is attached on the drive shaft (Fig. 3). The specimen container with the volume of 15 liters is filled with fresh concrete. The device holder with the antislip rods is placed into the specimen container. Due to the built-in variable speed drive, different speed settings are possible to realize. A shear profile can be freely defined. The eBT-V measures the torque on the Vane geometry as a function of the speed. According to Bingham the plastic viscosity and the yield stress can be calculated from the angular velocity and the measured torque. The calculation from torque to shear stress for the V-mode can be done due to Reiner-Riwlin equation.

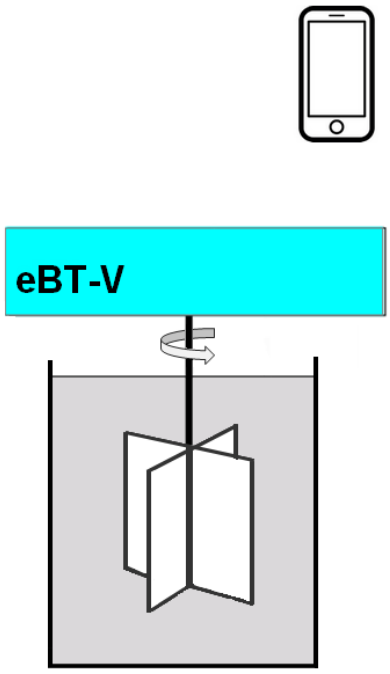


Figure 3: Theory of operation - V-mode

By using of the Vane measuring cell the damage of the structure of the sample is minimized. Due to the star arrangement of the wings, the sliding on the wall of the probe is almost completely prevented. Wall slipping on the container surface is also prevented by the use of a device holder with integrated antislip rods which was developed for this purpose.

V-mode is particularly suitable for modern concretes such as SCC and UHPC up to max. grain size of 32 mm.

For the P-mode and V-mode simple wireless control via smartphone allows fast and easy operation of the device as well as a fast transmission via Bluetooth (R) and display of the results. The device is battery powered. The package contains rechargeable battery, battery charger, Android smartphone incl. case and charger. The raw data and the data analysis will be exported as Excel files (*.XML).

3 Installation of soft- and hardware

3.1 Smart phone

The delivery includes a current smartphone. All needed apps are preinstalled, the eBT-V and smart phone are paired (Bluetooth).

The app for the smart phone is already installed there. The latest version can be downloaded from the Schleibinger eBT-V page.

We strongly recommend to **disable** the automatic screen rotation. The app is designed for optimum display in portrait format.

Figure 4: Scan QR code to download and install

Tap to the eBT-V icon on the smart phone to open the application. There are three tabs

- **Data on Phone** - for the imported measurements stored in the internal database of the smart phone app
- **eBT-V-device** - for the remote control of the eBT-V over the Bluetooth
- **Profiles** - for the creation and management of the speed profiles

By switching to the eBT-V-device Tab the app will try to connect the eBT-V by Bluetooth and read the headers of the measurements (if existing) (Fig. 5 left). If no paired device will found, app will ask to make the pair procedure first [Fig. 5 right).

If the Bluetooth is not enabled, the app will ask the user to enable it ("Bluetooth permission request" window). When the connection is established, the blue LED "BLUETOOTH" on the eBT-V is lightning constantly.

Requirements for a smart phone

Any smart phone with Android 2.X and higher and integrated Bluetooth transceiver can be used.

The eBT-V smart phone app is a non-Market app. To allow installation of non-Market apps on other smart phones then delivered, please enable "Unknown sources" on your Android.

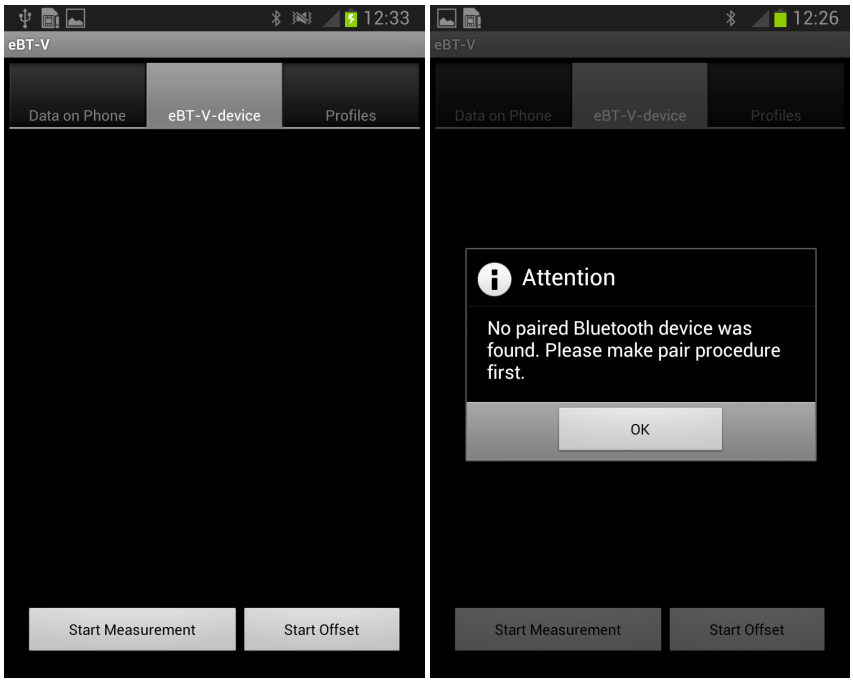


Figure 5: connection via Bluetooth (R)

3.2 Preparation for measurement

3.2.1 Placing the batteries into the eBT-V

The eBT-V is operating with a rechargable battery pack (NiMh 24 V - 3600 mAh). The accu pack is inserted on the top of the device.

- open the battery cover on the top of the device
- Put the accu pack in the right direction. Observe the space for the connector and cable [Fig. 6, 7).
- Use only a genuine battery pack!
- If not using the device for longer time, take out the accu pack!
- Recharge the accu pack using the delivered charger.

Attention:

After placing the accu pack, make sure that the lid is waterproof mounted!

The eBT-V is saving measured data and settings during accu pack change. The rechargable accu pack is valid for approx. 20 measurements.

The real time clock which is integrated into the eBT-V is running for approx. 30 days without batteries. Before you start a measurement, we advice you to control the battery status using the smart phone (see section 3.2.2 Control of the battery status).

accu pack warnings!

- Do not mutilate, puncture, or dispose a accu pack in fire. The accu pack can burst or explode, releasing hazardous chemicals.
- Discard used accu packs according to the manufacturer's instructions and in accordance with your local regulations.

Figure 6: Put the accu pack in the right direction. Observe the space for the connector and cable.

Figure 7: After placing the accu pack, make sure that the lid is waterproof mounted

3.2.2 Control of the battery status

From the eBT-V app on the smart phone select the tab **eBT-V-device**. Open the menu, tap the command button **Status**. After the end of the data transmission the smart phone displays all settings actually saved on the eBT-V as well as the actual value of the supply voltage of the eBT-V in the form Battery voltage 24 V (Fig. 8).

- The value should be higher than 23.5 Volt (green background) if a longer series of the measurements is planned.
- The value inbetween 22 and 23.5 Volt shows yellow background. Keep the second battary prepared.
- If the supply voltage is lower than 22 V (red background), change the accu pack immediately.

If the eBT-V is switched on, the supply voltage is checked every two minutes.

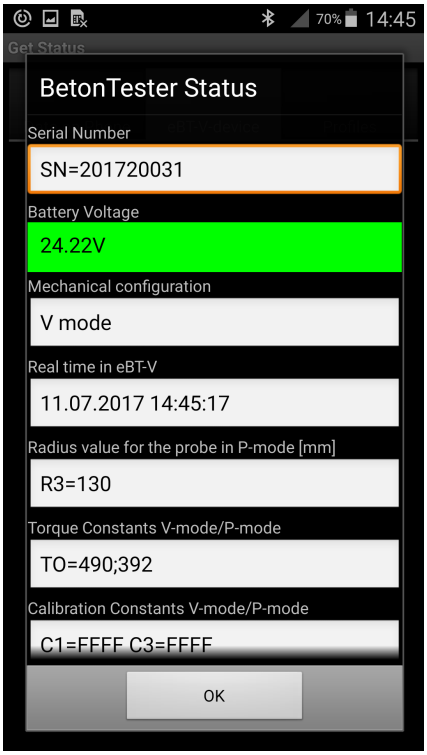


Figure 8: The status window shows current informations

3.3 Power-ON, Power-DOWN and Power-OFF

For the power-ON push the red button on the top of the device. The green LED "READY" is blinking, the blue LED "BLUETOOTH" is also blinking (faster). The eBT-V is now ready for use.

The eBT-V is going to power save state after 2 hours without activity.

3.4 LED indicators

LEDs	Notation	off	blinking	on
LED - green	Ready	power off	power on/not offset	power on offset is done eBT-V ready
LED - red	Working			offsetting or measurement in progress
LED - blue	Bluetooth		disconnected	connected

4 Handling of the eBT-V

4.1 Handling of the eBT-V in P-mode

4.1.1 Profile input for the measurement in P-mode

The job or program to be performed by the eBT-V is defined in a so called profile. The profile defines the rotation velocity of the device. Each profile can contain up to 8 segments. A segment specifies how long (angle) the device has to rotate and the angular velocity at the beginning and the end of the segment. With a different velocity at the beginning and end of the segment you can assign the slope of the velocity (ramps).

Example:

A simple ramp from 0 °/sec at beginning to 20 °/sec. at half of the turn (1. segment) followed by a ramp from 20 °/sec to 0 °/sec at 360 ° (2. segment) has to run as follows:

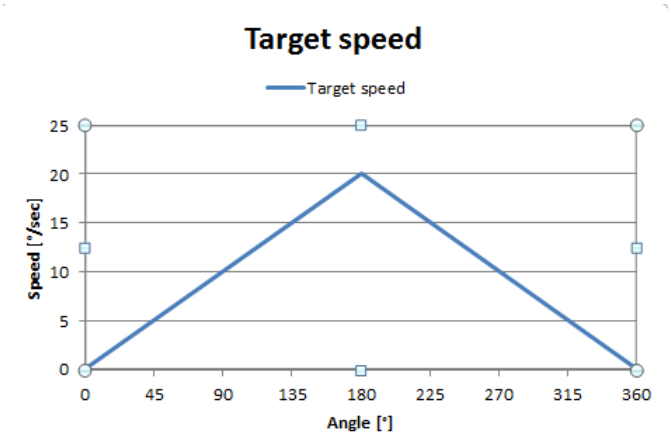


Figure 9: Speed profile as a diagram

The profile from the Fig. 9 can be transformed to the table shown in Fig. 10:

Segment-Nr.	End Angle [°]	Start speed [°/sec.]	End speed [°/sec.]
1	180	0	20
2	360	20	0

Figure 10: Speed profile as a table

Creating new profile

To create a new profile change to the **Profile** tab and select from the MENU **NEW** (Fig. 11).

- Select the P-mode for measurement in P-mode by tap the buttom **Mode selector**
- Enter the profile name and the profile comment. Tap **ok**

Create segment no. 1 Enter the end angle [degree] for this profile segment

- Enter the angular velocity [deg/sec] at the start and at the end of this profile segment. Please note the values!

- Tap **add**

create segment no. 2 Enter the end angle [degree] for this profile segment

- Enter the angular velocity [deg/sec] at the start and at the end of this profile segment. Please note the values!
- Tap **add** to add additional profile segments or tap **end** to create the profile

Hints for creating and using the profiles

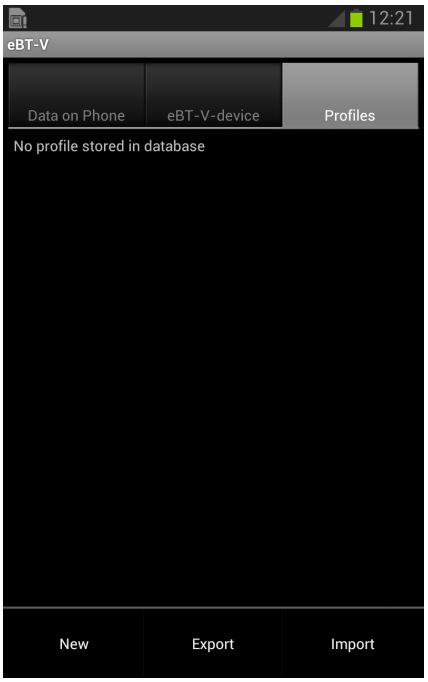
- After creating a profile, it has to be send to the eBT-V device [Fig. 12):
  1. select the profile from the profile list
  2. send the profile to the device.

  This action is confirmed only on the smart phone by the confirmation window "Profile was send and stored successfully" (Fig. 13).
- After sending the profile successfully, it is stored in a non-volatile memory until you send an other one.
- It is not possible to read back the profile or information (name) from the eBT-V into the smart phone. In case you are not sure, please sent the appropriate profile again.
- You can always modify the values in a segment, but you can't add or remove a segment after profile was created. In this case, please create a new profile.
- Keep in mind the real speed is depending on the consistency of the tested material and on the battery status. You can check the speed curve in tab **Data on Phone** -> **Chart - speed vs. time**.
- You can export selected profiles for save, backup or for transfer to another smart phone. Use the function **Export** on the current phone. In the **Profiles** tab select the profiles you want to export, open the menu and choose "Export". The selected profiles will be exported into a xml-file "BetonTesterProfiles.xml" into the folder "storage/sdcard0/eBT-V-Data". This folder is also a exchange place for the import. The xml-file for the import has to be here.

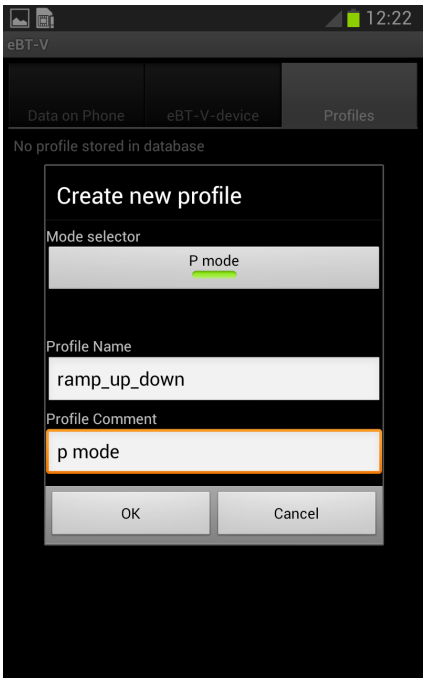
4.1.2 Preparation for measurement in P-mode

Align the specimen container in a horizontal position. Put the protection sleeve on the shaft of the specimen container (pot). Depending on the used pot approximately 40 or 20 liter of fresh concrete are filled into the upper edge of the measuring container, condense the material by a vibration table or by hand with some soft knocks and smooth it down with a batten. Make sure the upper part of the shaft is not contaminated with concrete after removing the protection sleeve.

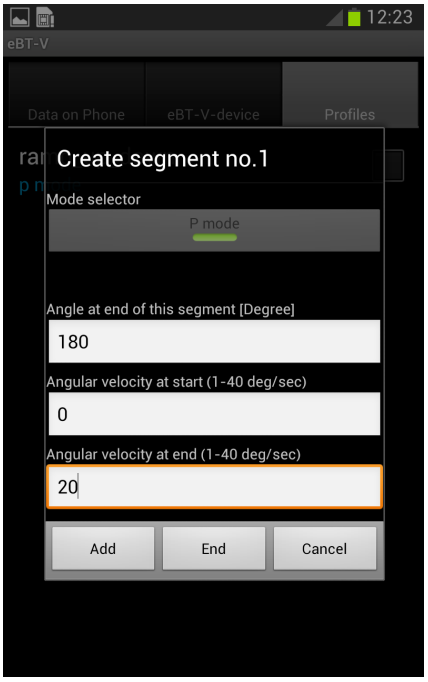
- Fix a spherical or cylindrical probe on the measuring cell pin of the eBT-V in a distance of 13 cm from the central shaft
- Turn on the eBT-V
- Select a profile and send it to the eBT-V



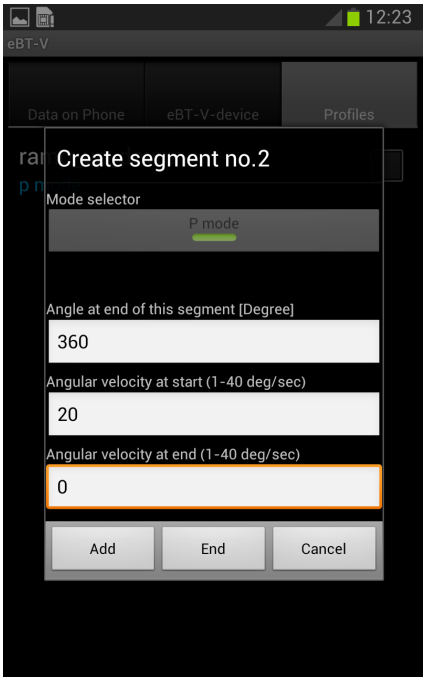
(a) Go to "Profile" tab; tap on the "New" button



(b) Select mode, enter a name and optionally a comment

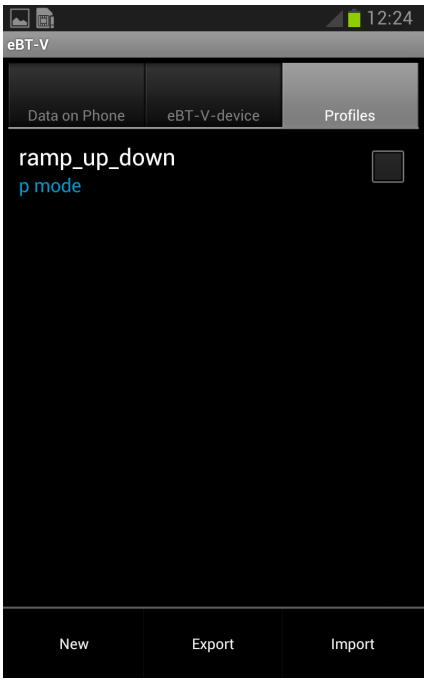


(c) Enter an end angle on the end of the first segment, angular velocity at start and at end of the first segment (first row from the table above)

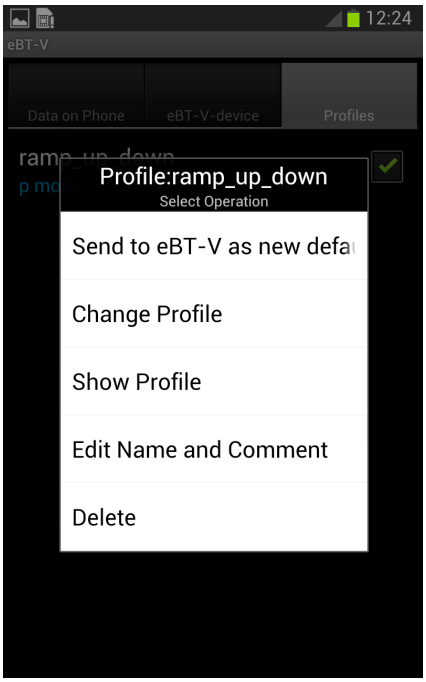


(d) Enter an end angle on the end of the second segment, angular velocity at start and at end of the second segment (second row from the table above)

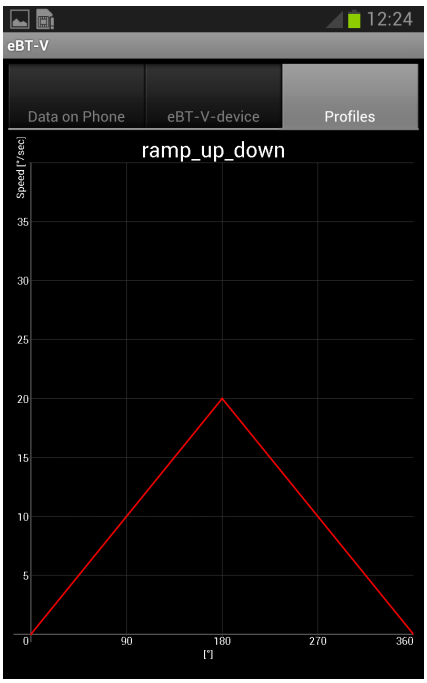
Figure 11: Create a new profile - P-mode - part 1



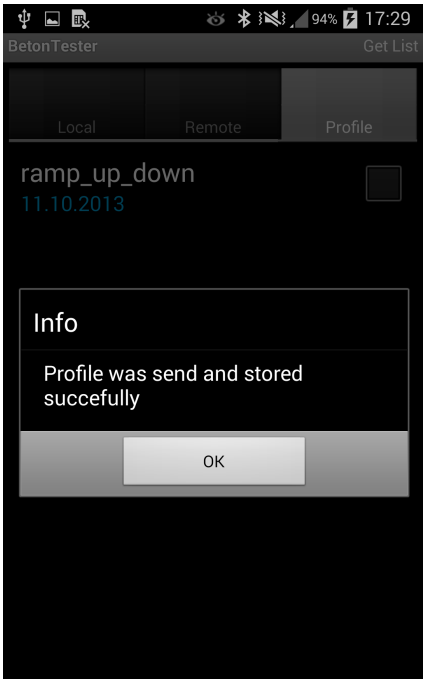
(a) A new profile was created. Tap on the created profile until a profile menu appears



(b) profile menu



(c) tap to "show profile" in the profile menu to check the profile curve.



(d) Now the created profile is stored in the eBT-V and ready to use.

If the created profile is OK, you can send it to the eBT-V.

Figure 12: Create a new profile - P-mode - part 2

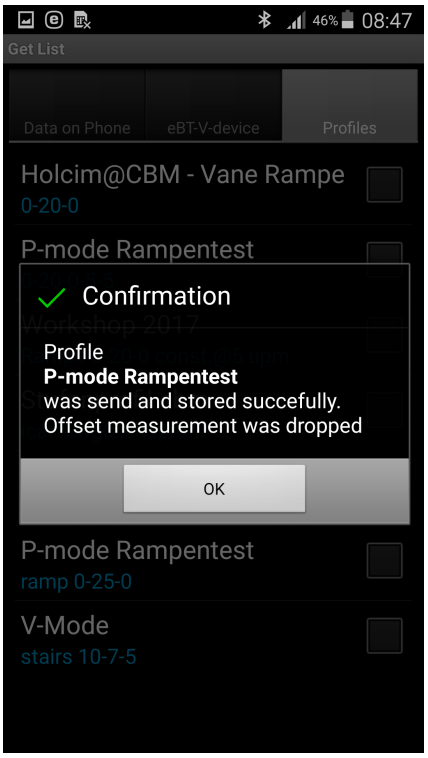


Figure 13: eBT-V in P-mode conformation

- Start **Offset measurement** (see chapter 4.1.3).
- Place eBT-V horizontally on the shaft in the middle of the filled sample container after Offset was done.
- Start the measurement.

4.1.3 Offsetting of the eBT-V in P-mode

please note: The Offsetting must always be carried out without the sample!

Switch on the eBT-V device with the red button. After a few seconds the green LED "READY" is blinking.

- Align the empty sample container in a horizontal position and place the eBT-V on it.
- Open the eBT-V app and switch to tab **eBT-V-device**
- Tap to the **START OFFSET**
- The red LED **WORKING** lights while the offset measurement is in progress
- After a few seconds the red LED **WORKING** switches off and the offsetting is finished
- The eBT-V is now ready for use; the green LED **READY** is lightning

Attention

you are requested to perform Offset measurement after each change of the mode!

4.2 Handling of the eBT-V in V-mode

4.2.1 Profile input for the measurement in V-mode

Compared to the eBT-V in P-mode the measurement profile for eBT-V in V-mode can consist of up to 8 segments. Each segment defines the time of the end of the segment and the rotational speed at the beginning and at the end of the segment.

Different profiles can be generated.

Example: ramp profile up and down

To create a new profile change to the **Profile** tab and tap to the MENU. Chose **NEW** (Fig. 14, 15)

- Select the V-mode for measurement in V-mode by tap the buttom **Mode selector**
- Enter the profile name and the profile comment. Tap **ok**

Create segment no. 1

- Enter the time [sec] of the end of this profile segment
- Enter the rotational speed [rpm] at the start and at the end of this profile segment. Please note the values!
- Tap **add**

create segment no. 2

- Enter the time [sec] of the end of this profile segment
- Enter the rotational speed [rpm] at the start and at the end of this profile segment. Please note the values!
- Tap **add** to add additional profile segments or tap **end** to create the profile

Example: step profile

To create a new profile change to the PROFILE tab and tap to the MENU. Chose **NEW** (Fig. 16, 17)

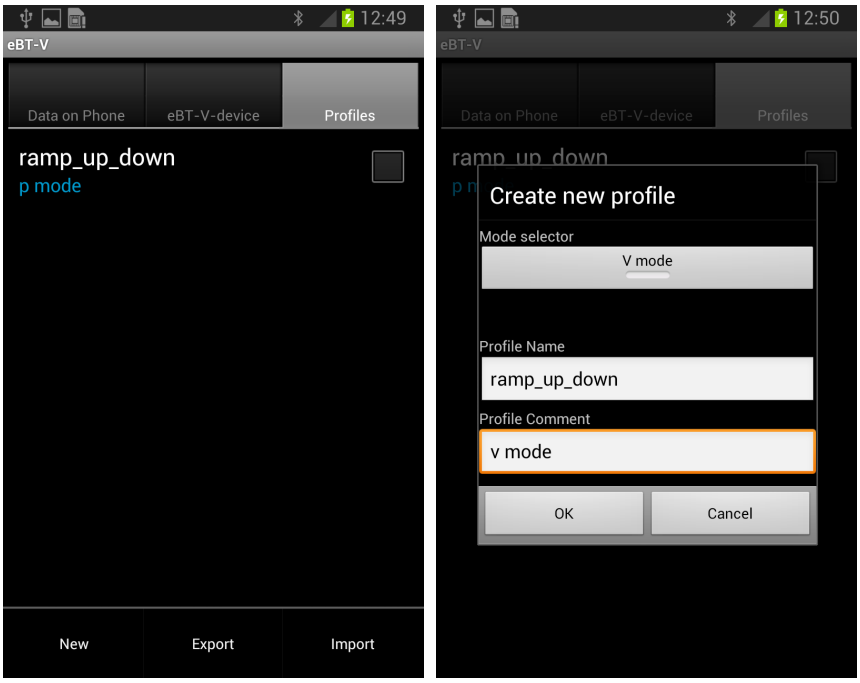
- Select the V-mode for measurement in V-mode by tap the buttom **Mode selector**
- Enter the profile name and the profile comment. Tap **ok**

Create segment no. 1

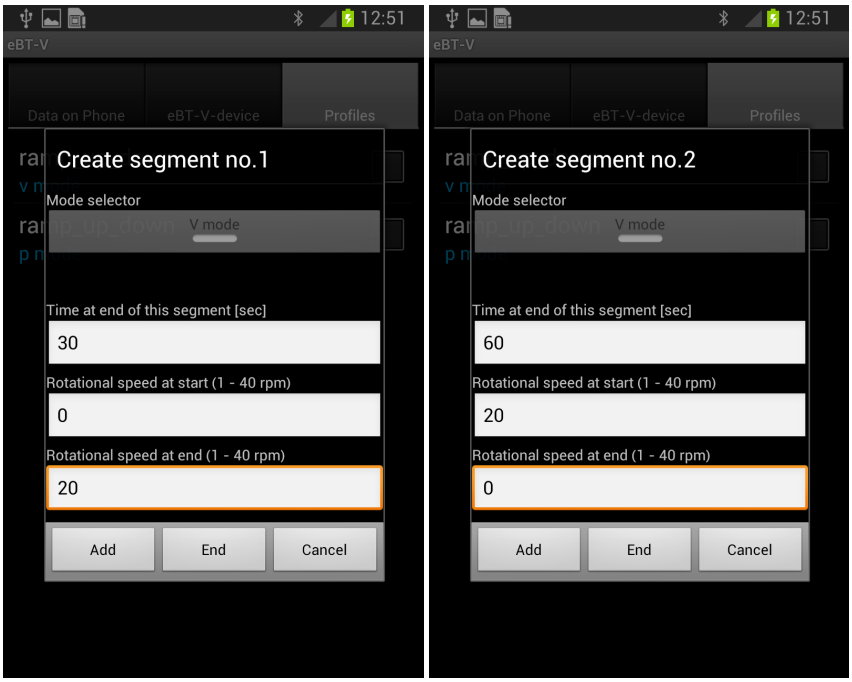
- Enter the time of the end of this profile segment
- Enter the rotational speed at the start and at the end of this profile segment
- Tap **add**

create segment no. 2

- Enter the time of the end of this profile segment
- Enter the rotational speed at the start and at the end of this profile segment
- Add up to 8 segments in the same way
- tap **end** to create the profile

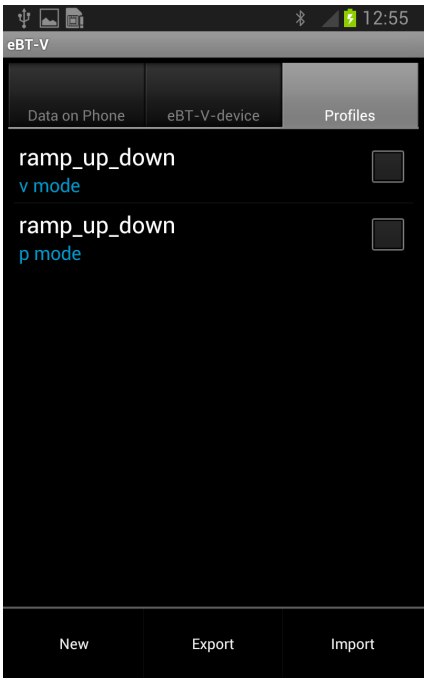


(a) Go to "Profile" tab; tap on the "New" button (b) Select mode, enter a name and optionally a comment

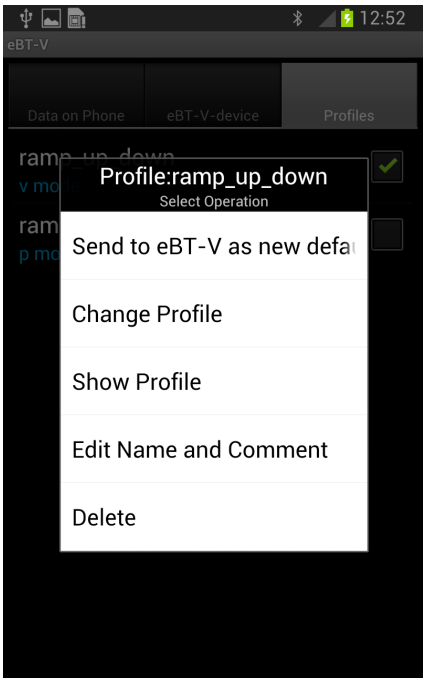


(c) Enter the time on the end of the first segment, rotational speed at start and at end of the first segment (d) Enter the time on the end of the second segment, rotational speed at start and at end of the second segment

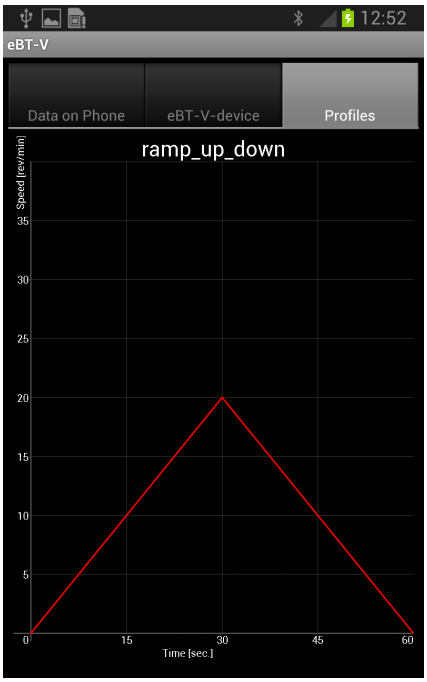
Figure 14: Create a new ramp profile - V-mode - part 1



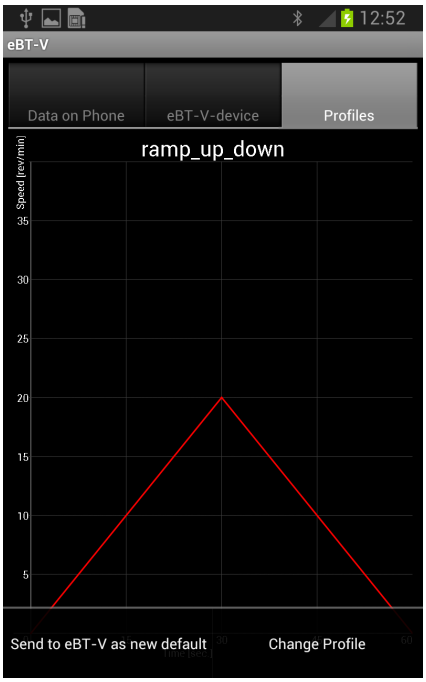
(a) A new profile was created. Tap on the created profile until a profile menu appears



(b) profile menu

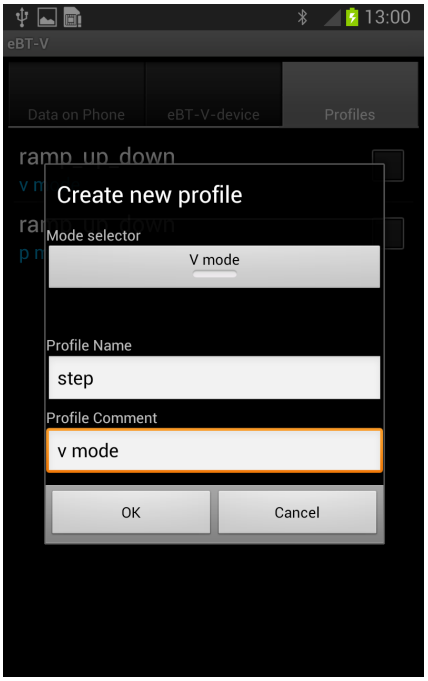


(c) tap to "show profile" in the profile menu to check the profile curve.

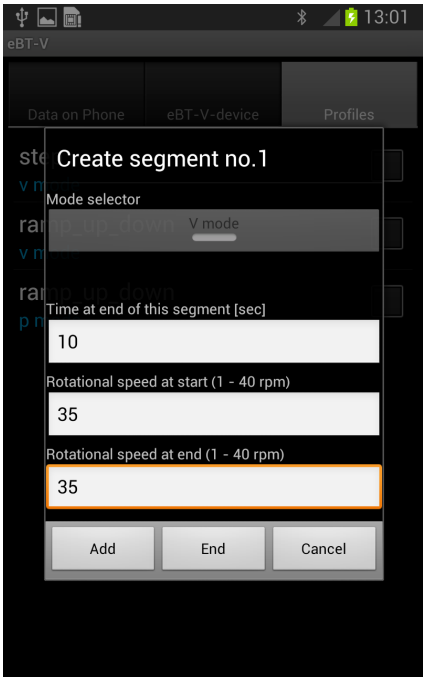


(d) If the created profile is OK, you can send it to the eBT-V.

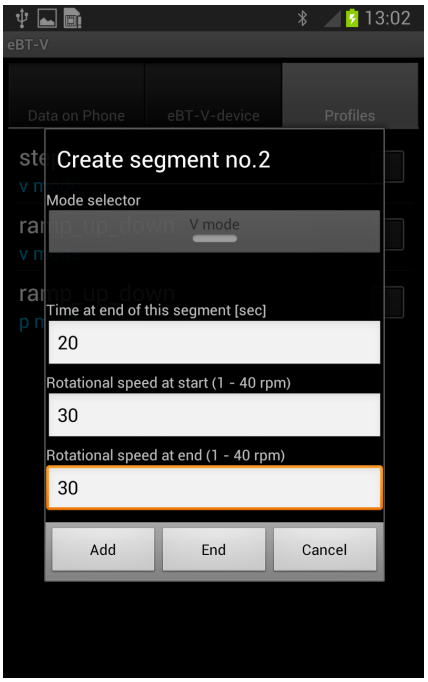
Figure 15: Create a new ramp profile - V-mode - part 2



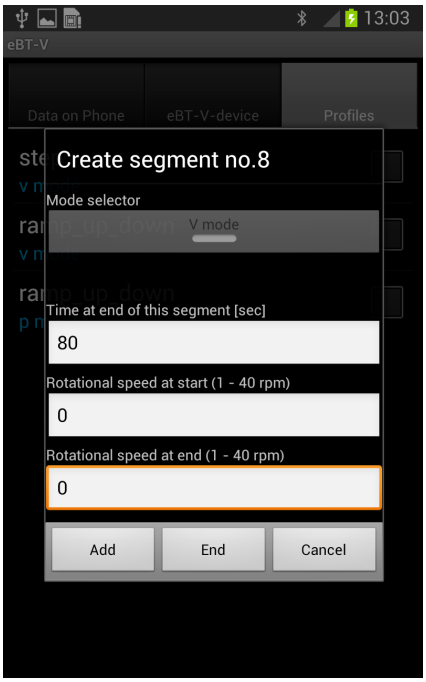
(a) Go to "Profile" tab; tap on the "New" button. Select mode, enter a name and optionally a comment



(b) Enter the time on the end of the first segment, rotational speed at start and at end of the first segment

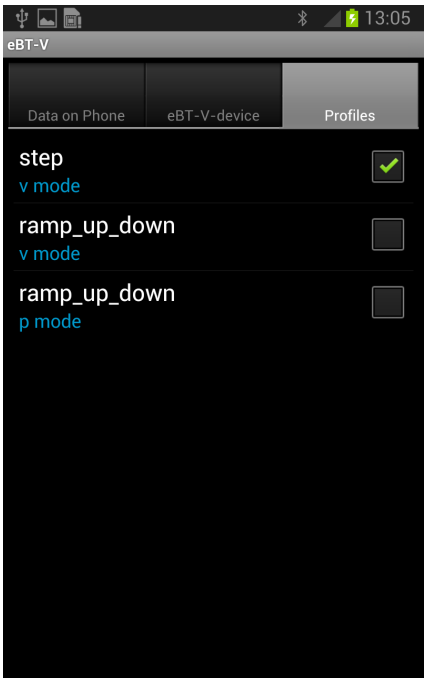


(c) Enter the time on the end of the second segment, rotational speed at start and at end of the second segment

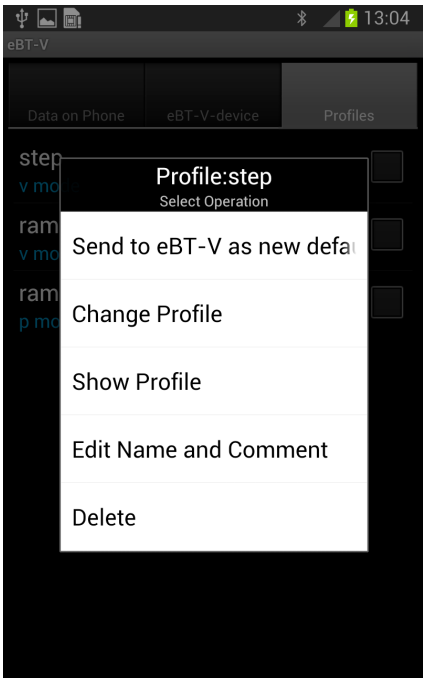


(d) Continue in the same way up to 8 segments

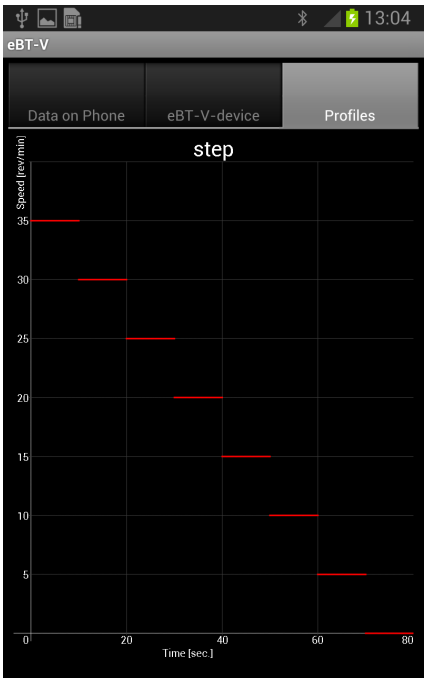
Figure 16: Create a new step profile - V-mode - part 1



(a) A new profile was created. Tap on the created profile until a profile menu appears



(b) profile menu: tap to "show profile" to check the profile curve, tap to "Send to eBT-V ..." to send the profile to eBT-V



(c) checking the profile curve.

Figure 17: Create a new step profile - V-mode - part 2

4.2.2 Preparation for measurement in V-mode

Remove the sensor from the P-mode first. For the measurement in V-mode a Vane probe and the holder have to be fixed on the device. The device is placed on the device holder and fixed with two screws (Fig. 18, 19).

The Vane probe is placed on the center shaft and fixed to the shaft with the screw provided for this purpose.

Before start measuring Offsetting has to be performed. Aligh the empty sample container in a horizontal position and place eBT-V on it. Perform the Offsetting (see also chapter 4.2.3).

Fill approximately 15 l of fresh concrete into the measuring pot which is provided for the V-mode. Condense material if necessary. Put the device with fixed device holder and the Vane probe on the measuring pot with fresh concrete by slightly turning back and forth.

Figure 18: eBT-V - fixing of the device holder

Figure 19: eBT-V - fixing of the Vane probe

4.2.3 Offsetting of the eBT-V in V-mode

please note:

The Offsetting must always be carried out without the sample!

Switch on the eBT-V device with the red button. After a few seconds the green LED "READY" is blinking.

- Align the empty sample container in a horizontal position and place the eBT-V on it.
- Open the eBT-V app and switch to tab **eBT-V-device**
- Tap to the **START OFFSET** (Fig. 20)
- The red LED **WORKING** lights while the offset measurement is in progress
- After a few seconds the red LED **WORKING** switches off and the offsetting is finished
- The eBT-V is now ready for use; the green LED **READY** is lightning

Attention

you are requested to perform Offset measurement after each change of the mode!

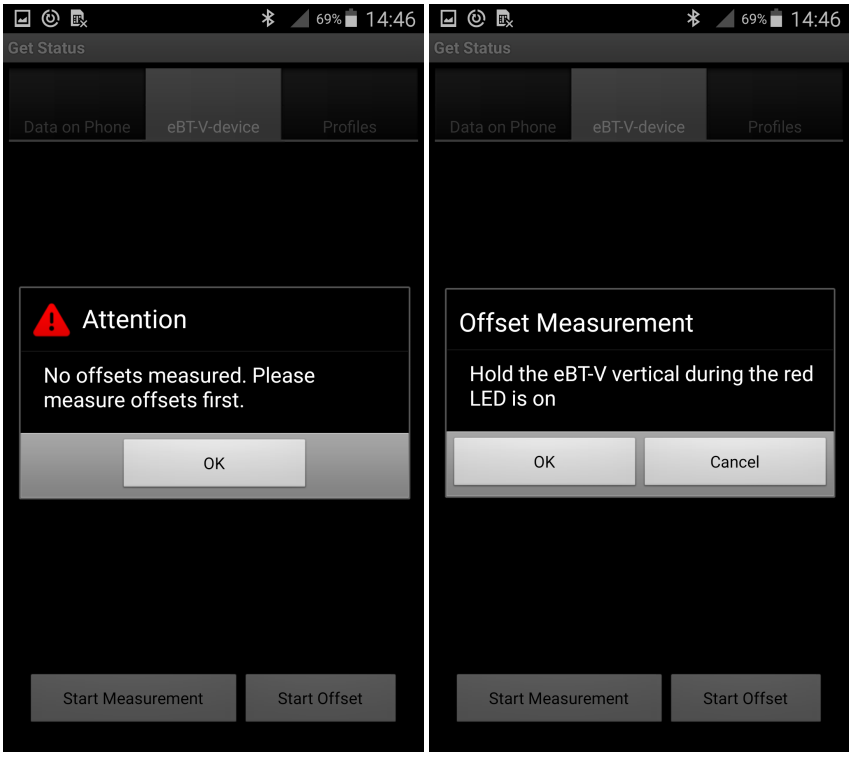
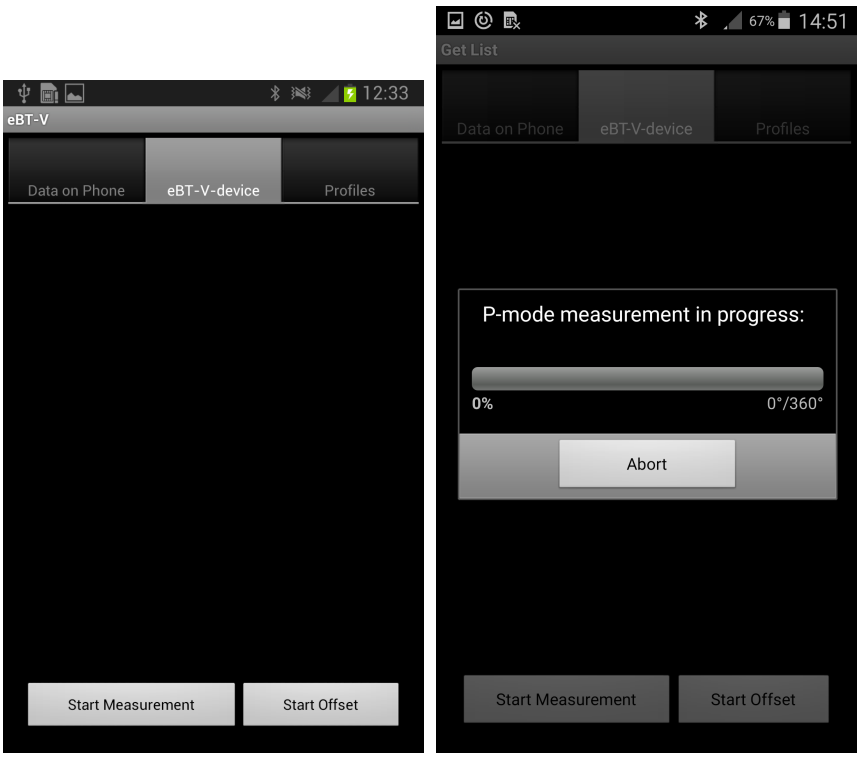


Figure 20: Offset measurement

5 The measurement

Before starting a new series of measurements, it is the best to delete all previous measured data from the eBT-V (assuming the are already transferred into a smart phone). See chapter 5.1.3 - Deleting of data sets from the eBT-V.

- Open the eBT-V app
- Select corresponding profile for V- or P- mode
- Perform offset measurement
- Place the device on the sample container
- In the **eBT-V-device** tab tap to the **START Measurement** (Fig. 21)
- Be careful, the eBT-V will turn
- The red LED **WORKING** on top of the eBT-V lights while the measurement is in progress
- A yellow progress bar in the **eBT-V-device** tab shows the progress
- After a few seconds the red LED **WORKING** switches off and the measurement is finished
- A header of the measurement appears in the **eBT-V-device** tab (consecutive number, date and time)



(a) Tap on the Start Measurement button for Start.

(b) The progress bar shows the progress in prercent or in degree.

Figure 21: Start the measurement

The measured data are non-volatile stored in the eBT-V device with a consecutive number, date, time and device parameter. Up to 37 measurements can be stored at the device eBT-V.

A further measurement can be started. An offsetting before the measurement is recommended.

If no other measurement or data transfer with the smart phone happens, the eBT-V goes into the sleep mode after approx. 2 hours. All LEDs on the top are switching off.

Cleaning the eBT-V

It is recommended to clean the sample container and the probes after each measurement.

5.1 Data transfer from eBT-V to the smartphone

5.1.1 Data transfer of single data

The measurement data are stored non-volatile at the eBT-V and have to be transfered to the smartphone. This will be done wireless as follows:

- Switch on the smartphone and the eBT-V with the red ON/OFF switch.
- Tip tab **eBT-V-device**. All data sets currently stored at the eBT-V device will be shown. Already transferred data sets appear in yellow. Not transferred measured data appear in green.
- Select the data which have to be transferred by taping the checkbox on the right side.
- Tap on the selected items and hold until the window **Select Operation** opens.
- Tap **Read** to transfer selected data sets.
- Progress bar shows the status of the transmission. After transferring the collor or the these data sets will change from green to yellow.
- Chose tab **Data on Phone** to see transfered items

5.1.2 Data transfer all data

- Select **eBT-V-device**
- Tap button **Menu** on the left corner
- Tap **Read All**
- All data that has not yet transferred are transferred to a smartphone

5.1.3 Deleting of data sets from the eBT-V

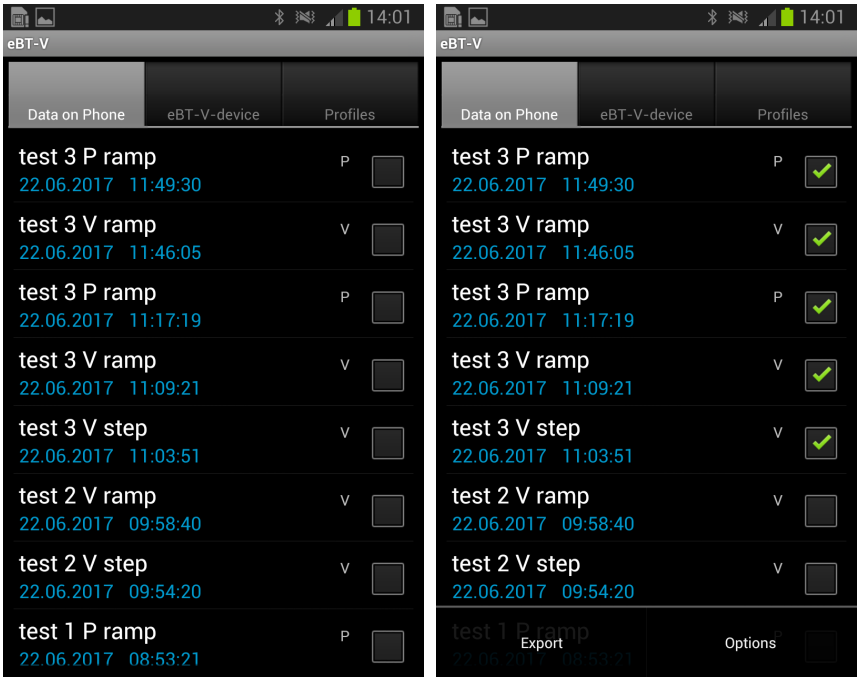
Up to 37 measurements can be locally stored at the eBT-V device. It is suggested to delete old data sets before starting a new measurement series.

- Switch to the **eBT-V-device** tab
- Select the data set you want to delete
- Tap and hold on the selected item

- Choose **Delete**

Or delete all data on the eBT-V at once:

- Select the **eBT-V-device** and tap to the MENU button (left corner on the bottom of the smartphone)
- Select "**Measurements**"
- Select **Delete**
- Confirm if you are realy sure



(a) Data on Phone (b) Data select on smart phone

Figure 22: Data on Phone

6 Data management

6.1 Data management on smartphone

6.1.1 Rename data

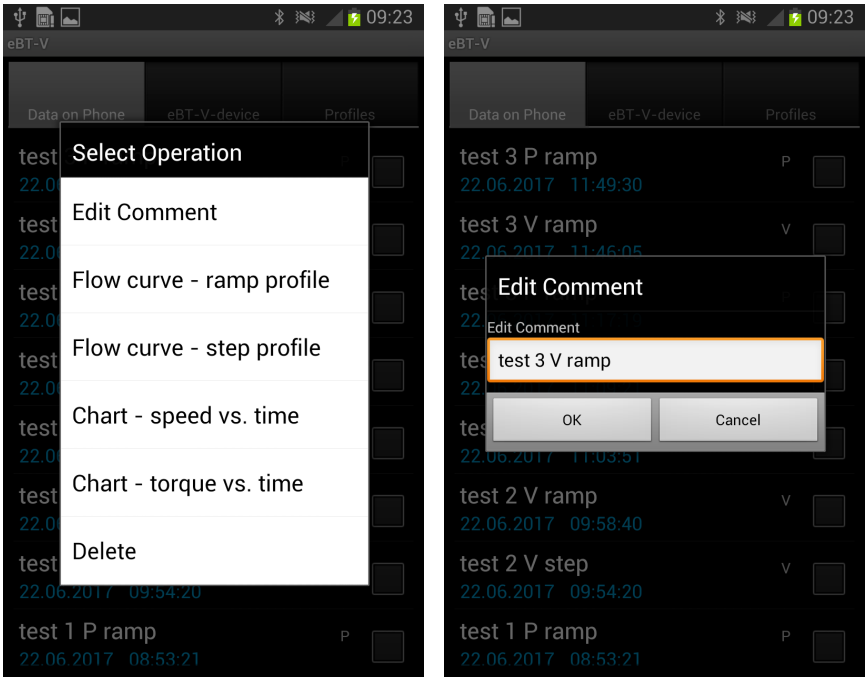
After the transmission switch to the **Data on Phone** tab. All transferred data will shown there [Fig. 22 a)). Next to the checkbox the **"P"** for the measurement in P-mode or **"V"** for the measurement in V- mode is shown. One ore more measurements can be selected by taping on the box next to the measurement (Fig. 22 b)). The name or description of each data set can be changed as well. Assigne the description by usig the option "**Edit Comment**" (Fig. 23):

- Select the data set for rename
- Tap and hold on the selected data set
- A new menu opens.
- Select **Edit Comment**
- Enter the comment

6.1.2 Graphical display

The graphical display of the measurement results can be done on the smartphone. The smartphone calculates and shows in graphical form the flow curve with relative viscosity (= the gradient of the straight line), and the relative yeald value (= axis segment of the straight line).

From the **Data on Phone** tab select one data set. To compare two or more data sets select two or more data sets accordingly.



(a) Tap and hold on the selected item. A menu window is opening, chose "Edit Comment"

(b) Enter the comment (name of the measurement)

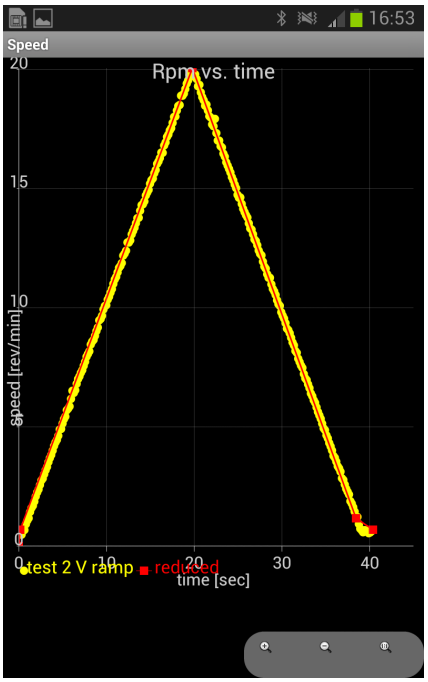
Figure 23: Name for the data set

- Open menu by tapping and holding the data set item.
- New window opens
- Select **Chart - speed vs. time** for displaying of speed versus time diagram (Fig. 24 a), b))
- Select **Chart - torque vs. time** for displaying of torque versus time diagram (Fig. 24 c), d))
- Select **Flow curve - ramp profile** for displaying of the flow curve for the measurements provided from ramp profile (Fig. 25 a), b))
- Select **Flow curve - step profile** for displaying of the flow curve for the measurements provided from step profile (Fig. 25 c), d)).

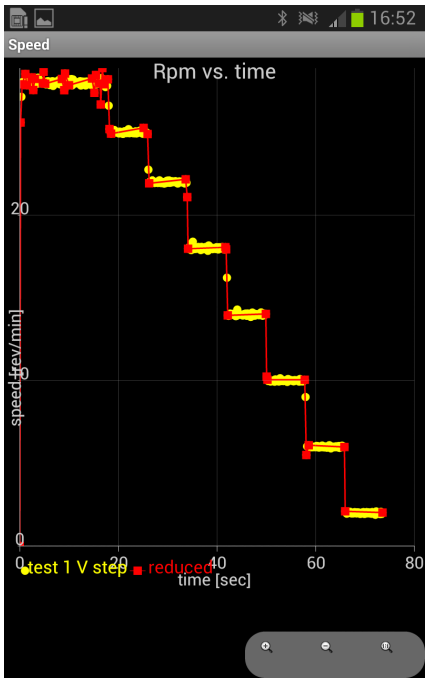
By selecting **Flow curve - ramp profile** the measured values will be displaying with the straight line. From the straight line the intercept point and the slop of the line will be shown (Fig. 25 a)). By selecting of two or more data sets and displaying flow curves the intercept point and the slope will be shown from the last measured data set only (Fig. 25 b)).

By selecting **Flow curve - step profile** for the measurements performed with step profile the average of the measured value for each step will be calculated and shown as a "dots" within the graphical displaying. From the straight line the intercept point and the slope of the line will be shown (Fig. 25 c)). By selecting of two or more data sets and displaying flow curves the intercept point and the slope will be shown from the last measured data set only (Fig. 25 d)).

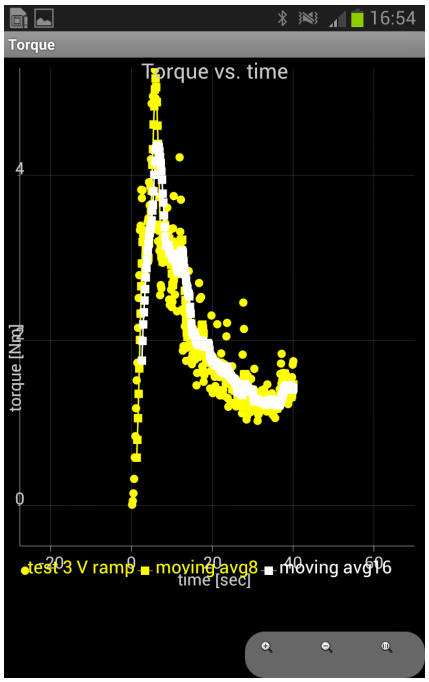
The calculation of the step values from the speed curve will be done by an algorithm which is searching the steps (red line, see also Fig. 24 b)) and calculating the average values for each step. Considering the



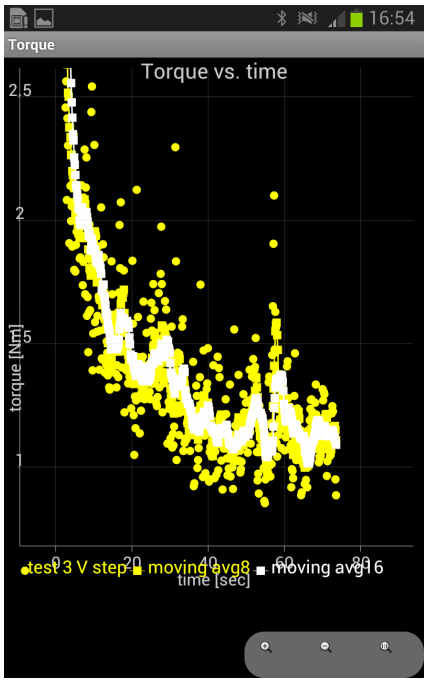
(a) Chart - speed vs. time, ramp profile, V mode.



(b) Chart - speed vs. time, step profile, V mode.

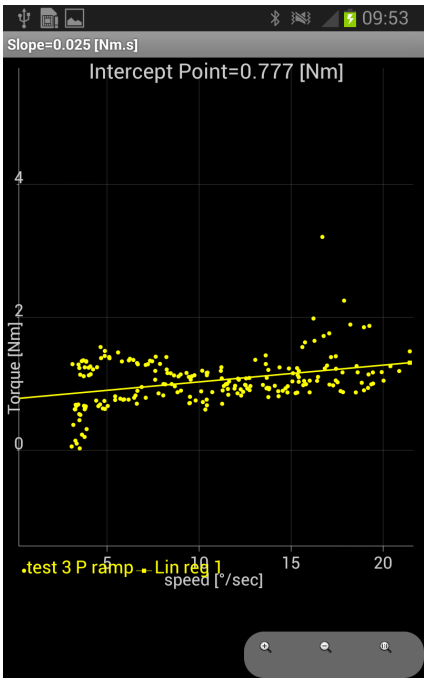


(c) Chart - torque vs. time, ramp profile, V mode.

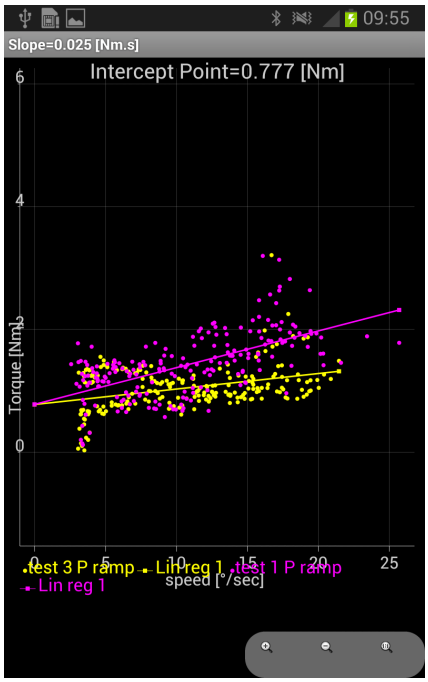


(d) Chart - torque vs. time, step profile, V mode.

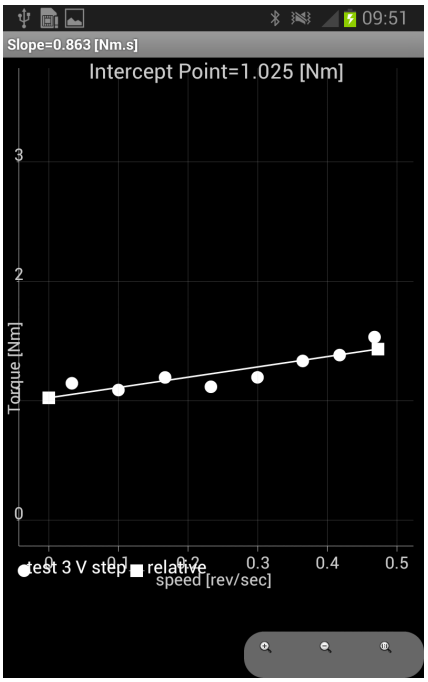
Figure 24: Graphical display - Part 1



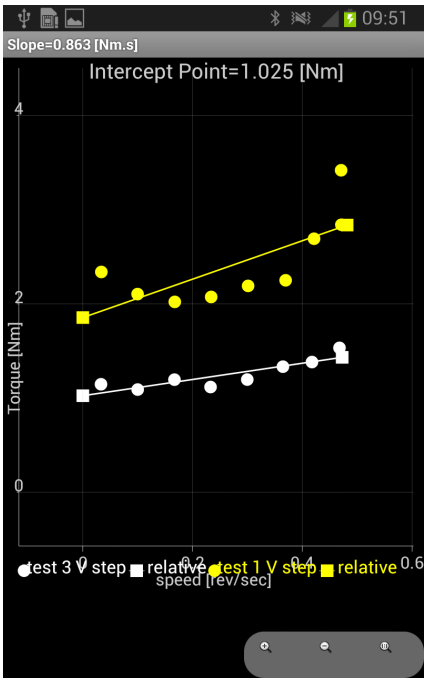
(a) Displaying of the flow curve, ramp profile, P mode.



(b) Displaying of two flow curves from different measurements, ramp profile, P mode.



(c) Displaying of the flow curve, step profile, V mode.



(d) Displaying of two flow curves from different measurements, step profile, V mode.

Figure 25: Graphical display - Part 2

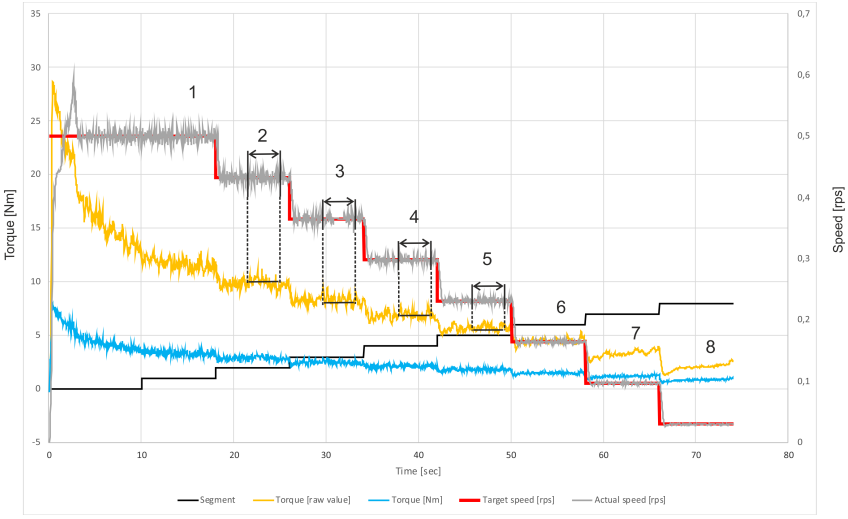


Figure 26: Calculation for the step profile curves

edge effects the values between 45 and 95 percent will be taken for the calculation of the torque average (Fig. 26).

Further profiles are possible. For example measured data of a self-consolidating concrete are shown in Fig. 27 (modified ramp profile, V mode).

6.2 Data transfer to the PC

The measured data can be transfered from the smartphone to a commen PC (Windows, MacOS or Linux). For the measurements export, the XML-File format is specified. The transfer can be done by:

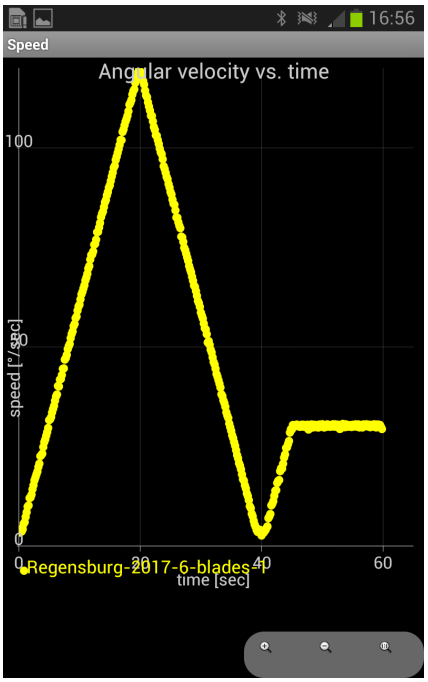
- USB - cabel
- Send by e-mail
- Share by Dropbox or other cloud services
- Download by Bluetooth or other installed services

6.2.1 Export data into Microsoft ExcelTM

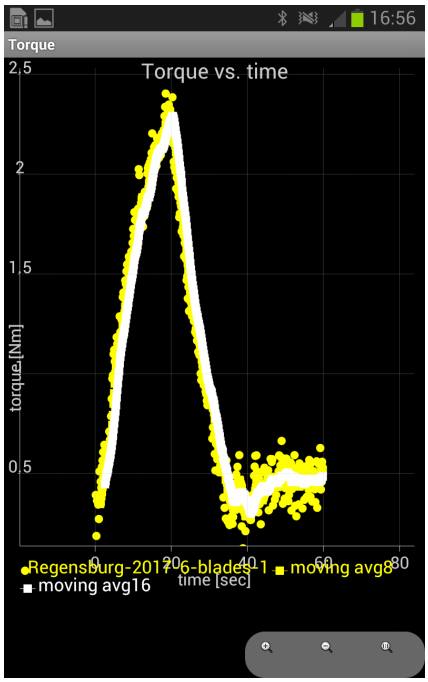
For the creating of a XML-file (Fig. 28):

- Select **Data on Phone**
- Select measured data sets for export
- Tap to the **Menu** button (left corner at the bottom of the smart-phone)
- Select **Export**
- Confirm the export of the selected measurements into a xml file
- Share immediately the xml file by taping on **Share**
- Tap **Cancel** if no immediately share has to be done

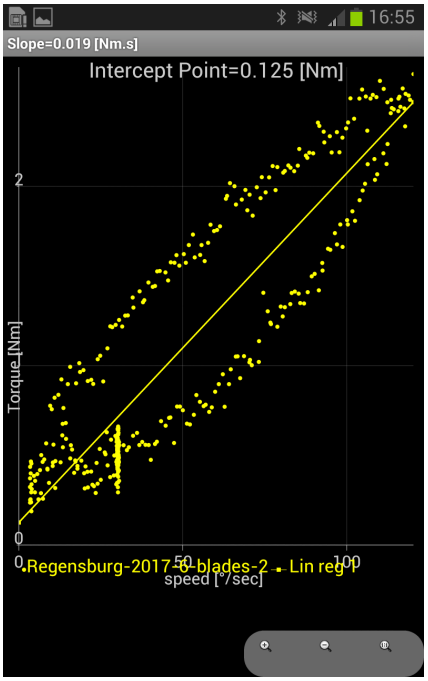
From the **Export** the data file named **BetonTesterMeasurements.xml** will be generated. If no immediately share was performed this xml file will be saved on the smartphone. From the installing the eBT-V app data folder **eBT-V-Data** will be created on the smartphone. All data exported will be saved there.



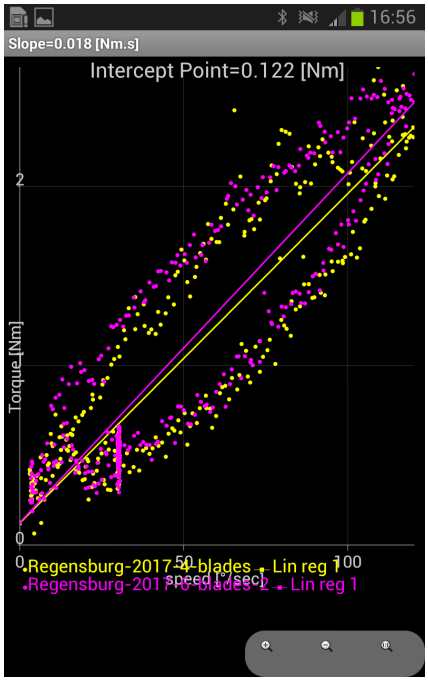
(a) Displaying of the profile: Chart - speed vs. time



(b) Displaying of the measured torque: Chart - torque vs. time.

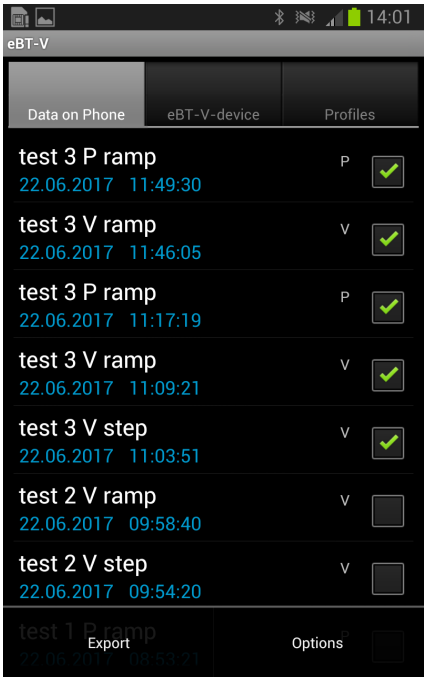


(c) Displaying of the flow curve

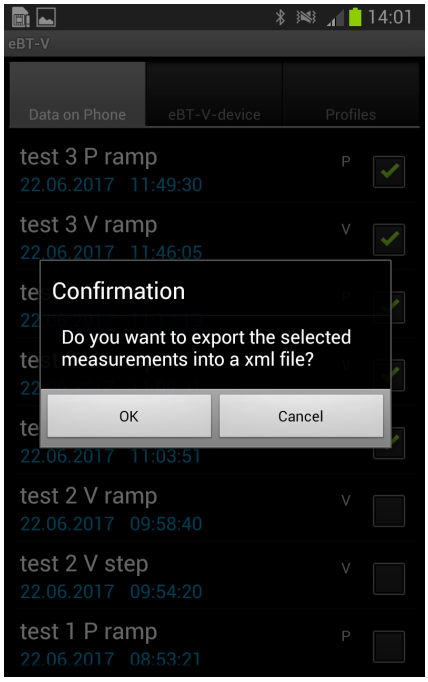


(d) Displaying of two flow curves from two different measurements.

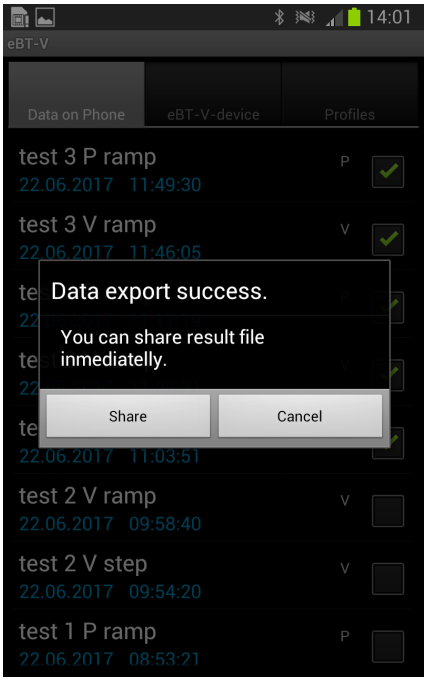
Figure 27: Example: measuring results of a self-consolidating or self-compacting concrete, V mode



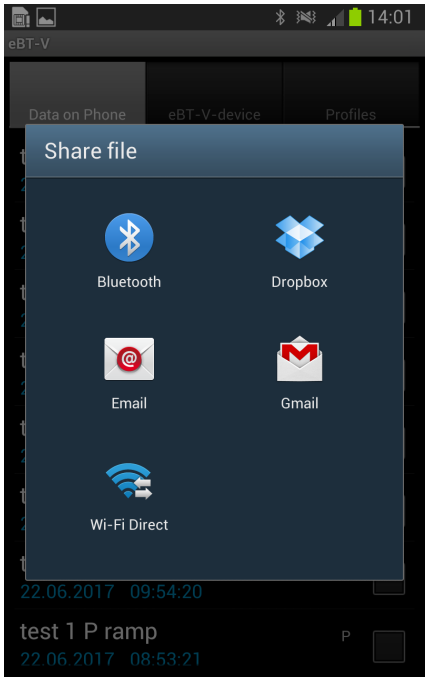
(a) Select "Data on Phone" and set check for the data sets to export, open MENU and tap "Export".



(b) Confirm the export of selected measurements into a xml file.

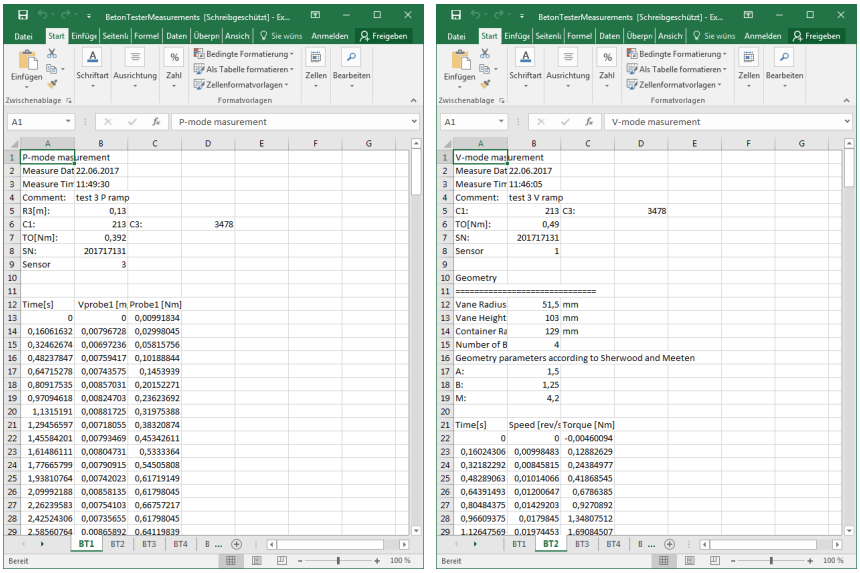


(c) After data export the xml file can be chared immedealy by taping "Share".



(d) Select the way for share

Figure 28: Export data into Excel



(a) Excel data sheet with measured results from the P mode

(b) Excel data sheet with measured resuls from the V mode

Figure 29: Excel data sheet with measured results

- Connect the smartphone with the computer
- Open the data folder **eBT-V-Data**
- Select the data file **BetonTesterMeasurements.xml** after the export was successful

please note!

Attention: save or rename the xml file first before the next data export will be done - the BetonTesterMeasurements.xml will be overwritten with new data!

Each measurement data set is presented as a spreadsheet. The tables and charts can be worked as possible in Excel (Fig. 29).

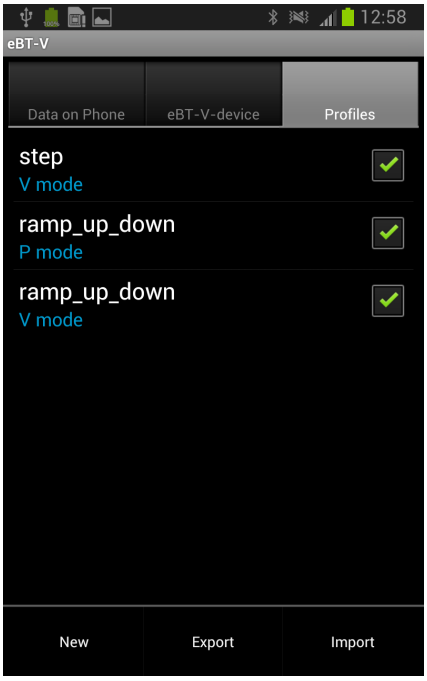
6.2.2 Profile import and export

The profiles (see also 4.1.1 Profile input for the measurement in P-mode and 4.2.1 Profile input for the measurement in V-mode) when generated will be stored on smartphone. For sharing the profiles or for the data backup the profiles can be exported and imported as a xml file.

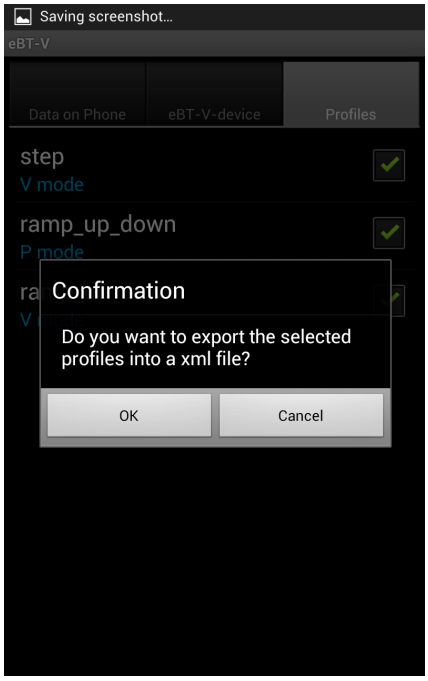
Profile export

The existing profiles can be exported and saved separately (Fig. 30).

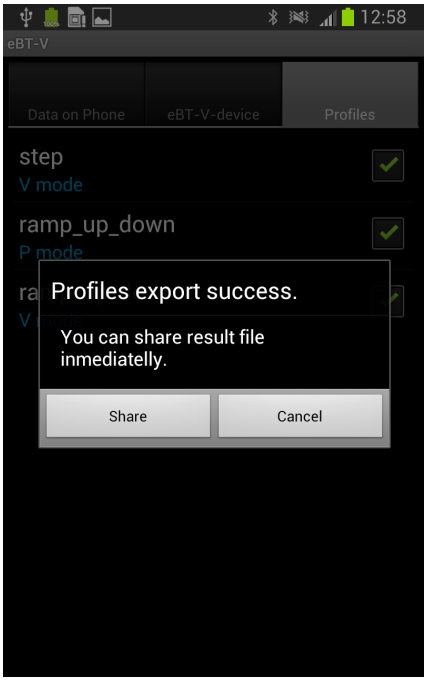
- Select profiles in tab **Profiles**
- Tap on **Export** in menu
- Confirm for export
- The export file can be shared immediately
- The excel file **BetonTesterProfiles.xml** will be generated and saved in the data folder **"eBT-V-Data"** on the smartphone



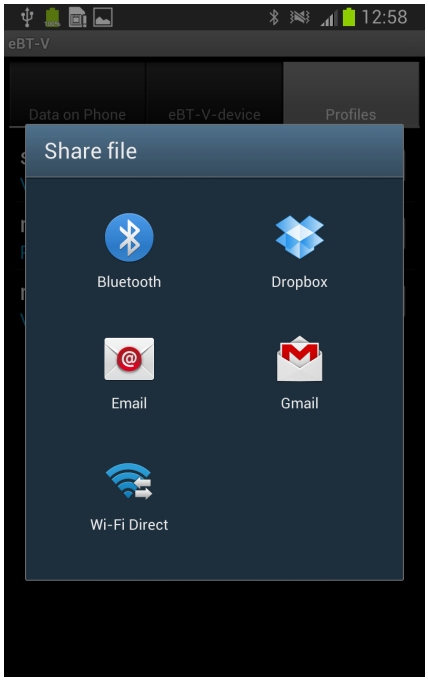
(a) Select profiles for export and tap "Export" in menu



(b) Confirm for export the selected profiles into a xml file



(c) Select "Share" for sharing the xml file



(d) Select the option for sharing

Figure 30: Profile export

Profile import

Profile import can be done from the data file **BetonTesterProfiles.xml** (Fig. 31).

- Save the data file **BetonTesterProfiles.xml** in the data folder **"eBT-V-Data"** on the smartphone.
- Start the eBT-V app
- Select the tap **Profiles**
- Select in menu **Import**
- Confirm for import the profiles

6.2.3 Database

For backup or sharing of the complete data base included measured data sets and profiles **Database export** and **Database import** can be done.

Database export

For export of the Database (Fig. 32):

- Select tap **Data on Phone**
- Select **Options** from the MENU button (left corner on the bottom of the smart phone)
- Select **Expert Settings**
- Enter the Password 2603
- Select **Database export** for export of the Database
- The exported Database will be saved in the data folder eBT-V-Data on the smartphone as a Data Base File **BetonTester.db**.

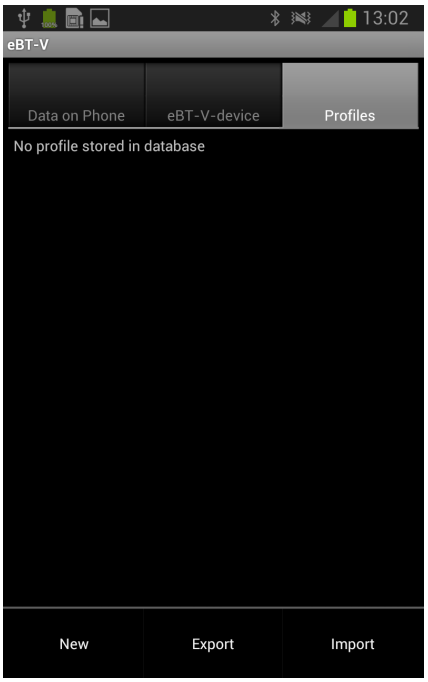
Database import

For the import of the Database the file **BetonTester.db** has to be saved in the data folder **eBT-V-Data** on the smartphone.

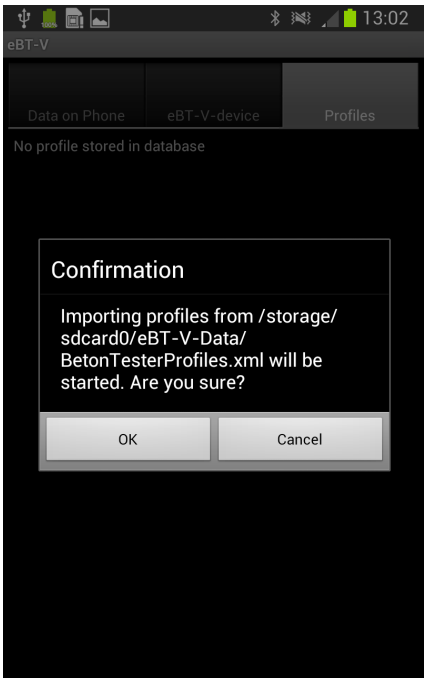
- Open eBT-V app
- Select tap **Data on Phone**
- Select **Options** from the MENU button (left corner on the bottom of the smart phone)
- Select **Expert Settings**
- Enter the Password 2603
- Select **Database import** for import of the Database (Fig. 32).

6.3 Deleting measurement data from the smartphone

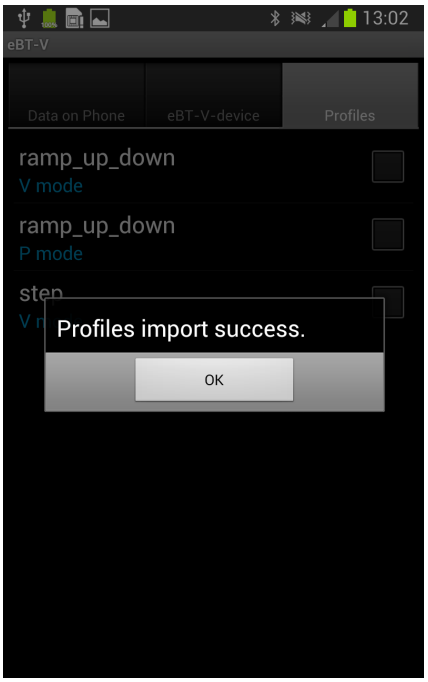
On the smartphone all measurements are saved in the internal database of the application program. Selected measurement data or all measurements at once can be deleted.



(a) Tap "Import" from menu

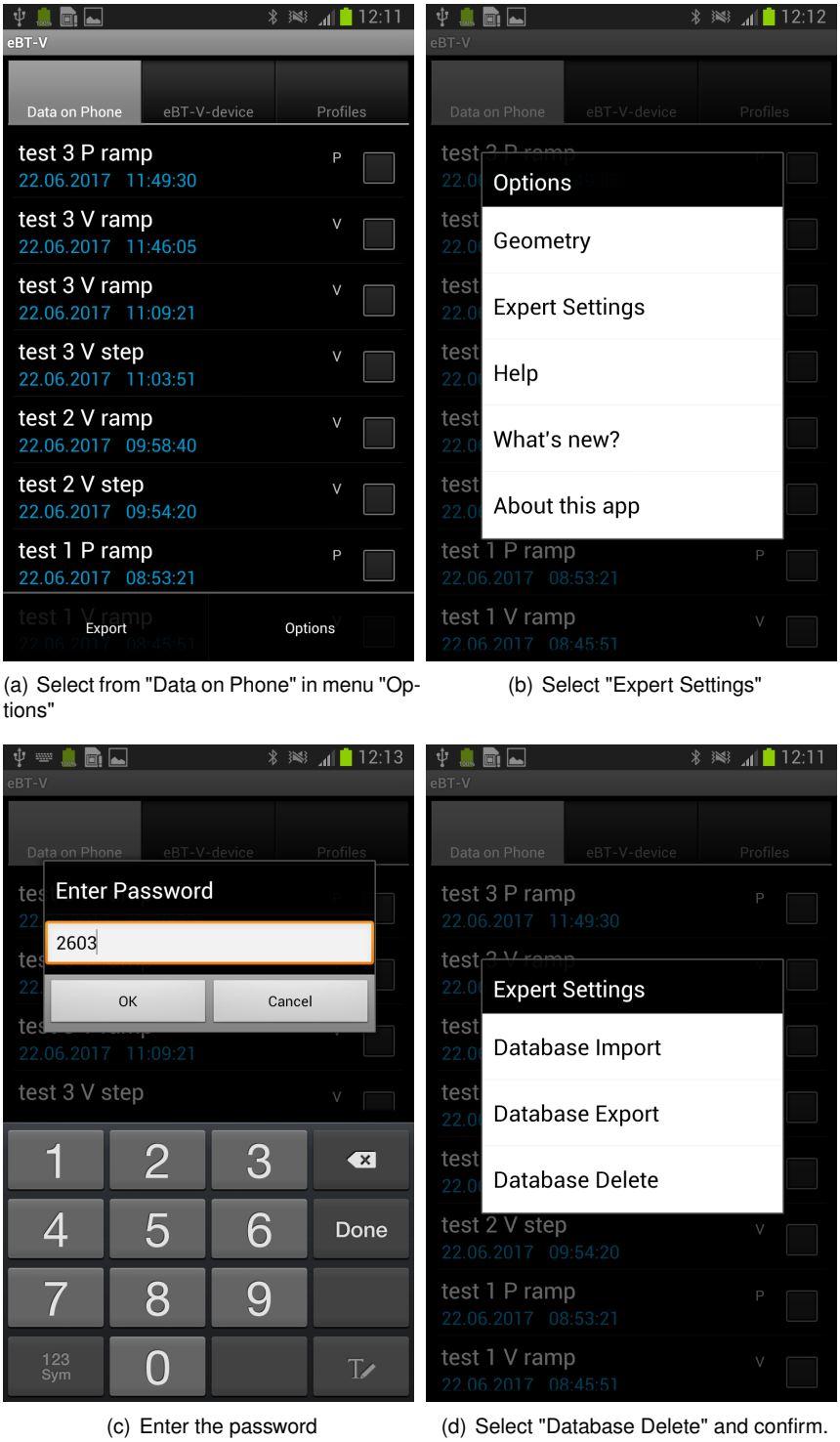


(b) Confirm import of xml file



(c) Success

Figure 31: Profile import



(a) Select from "Data on Phone" in menu "Options"

(b) Select "Expert Settings"

(c) Enter the password

(d) Select "Database Delete" and confirm.

Figure 32: Database Export

6.3.1 Deleting of single measurement data from the smartphone

For deleting of single data sets (Fig. 33):

- Select **Data on Phone** and set check for data to delete
- Tap on one of the selected data and keep as long the window **Select Operation** appears
- Select **Delete**
- Confirm if you are realy sure with **OK**

6.3.2 Deleting the whole data base

For deleting of all data sets on the smartphone at once (Fig. 32):

- Select **Data on Phone** and tab the MENU button (left corner on the bottom of the smart phone)
- Select **Options**
- Select **Expert Settings**
- Enter Password 2603
- Select **Database Delete**
- Confirm if you are realy sure

7 Settings

The basic settings of the eBT-V can be changed in **Settings**. All functions require a data transfer between smart phone and eBT-V. Switch to the **eBT-V-device** tab and tap to the MENU button (left corner on bottom) and select "**Settings**"

7.1 User settings

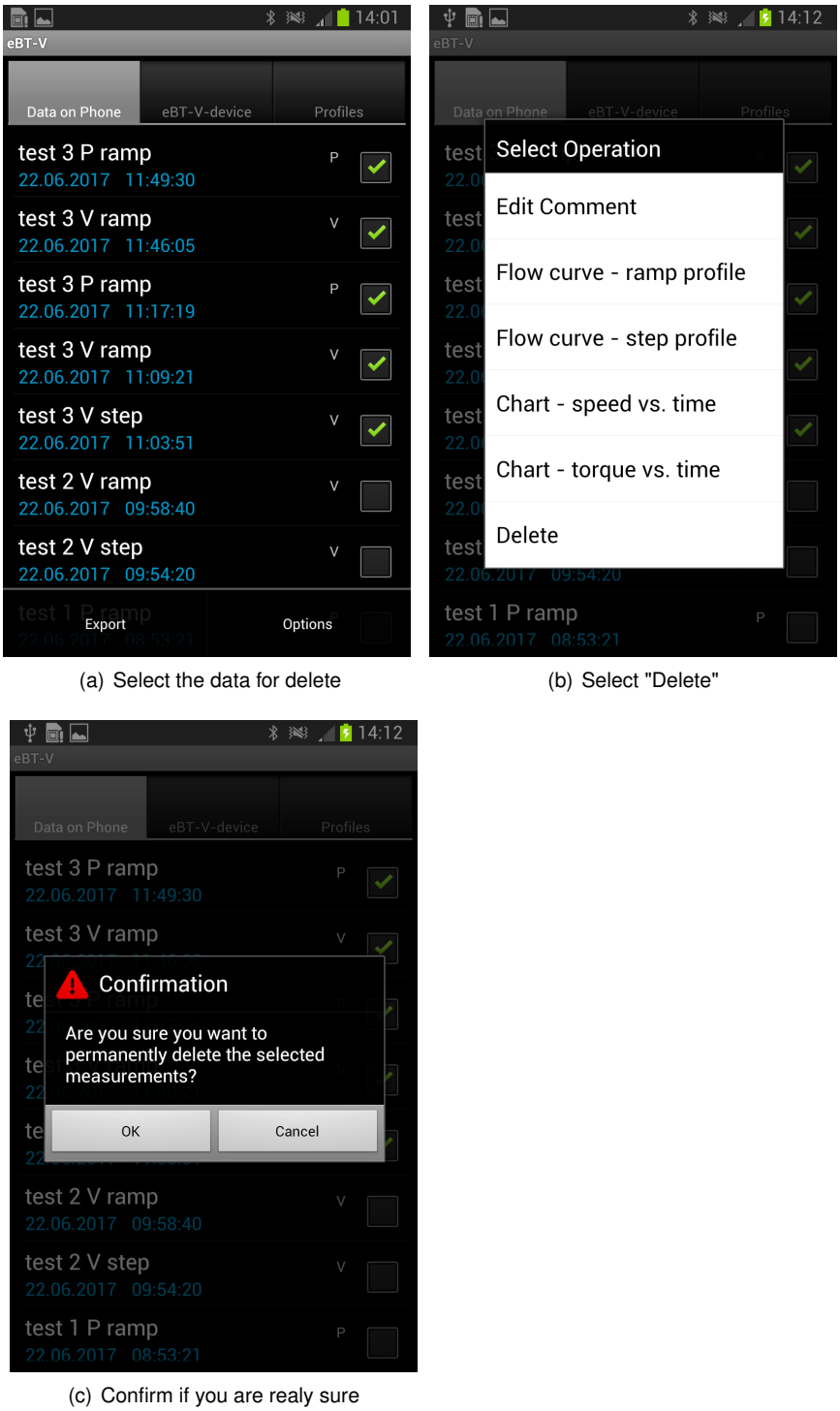
User settings have the following meanings:

- Set Time - to set the date and time of the eBT-V. The settings are obtained from the smartphone system time/date automaticaly.
- Expert Settings - next options level for calibration (protected by password). Expert settings are for the service. Please, contact the company Schleibinger Geräte before you make any changes. The password is 2603.
- Set Torque - to set the torque constant for the calibration
- Calibration - to calibrate the particular sensors.
- Extended Settings - next settings level to set the deep machine configuration. Protected by another password. Reserved for service purposes only!

8 Bluetooth

The eBT-V can be connected only with one smartphone at the same time.

To activate Bluetooth, on the Applications screen, tap Settings → Bluetooth, and then drag the Bluetooth switch to the right.

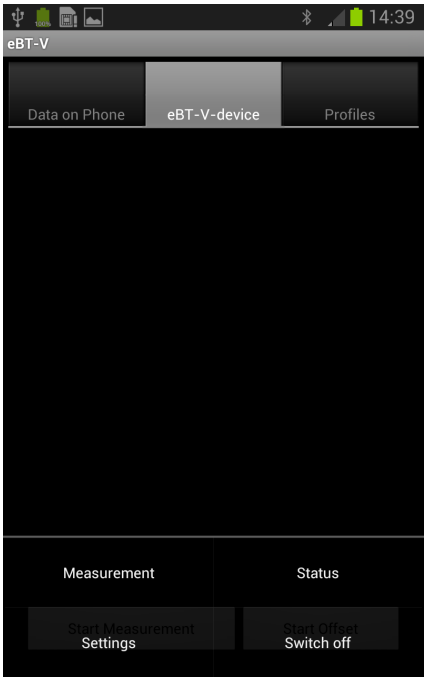


(a) Select the data for delete

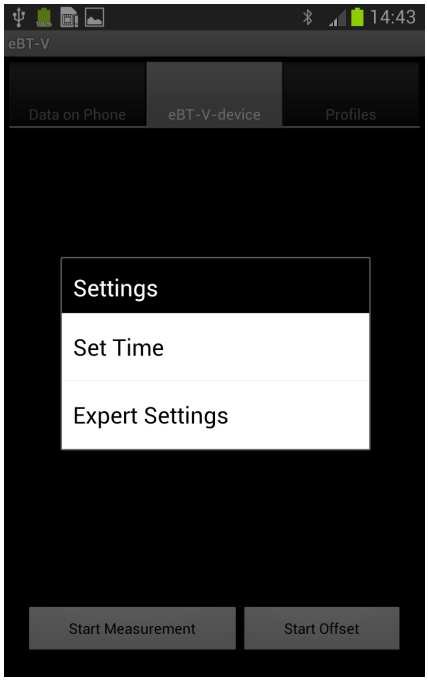
(b) Select "Delete"

(c) Confirm if you are realy sure

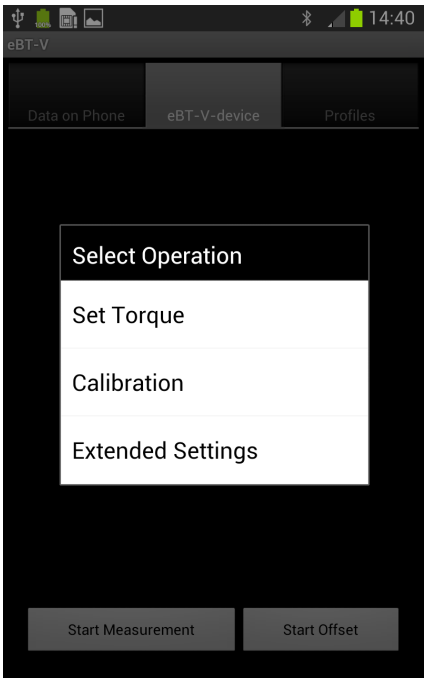
Figure 33: Deleting data sets from the smart phone



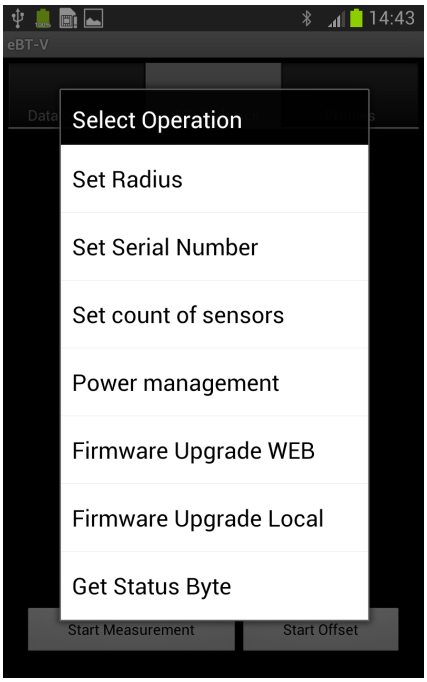
(a) Select "eBT-V-device" and tap MENU



(b) Level 1 - User settings



(c) Level 2 - Expert settings



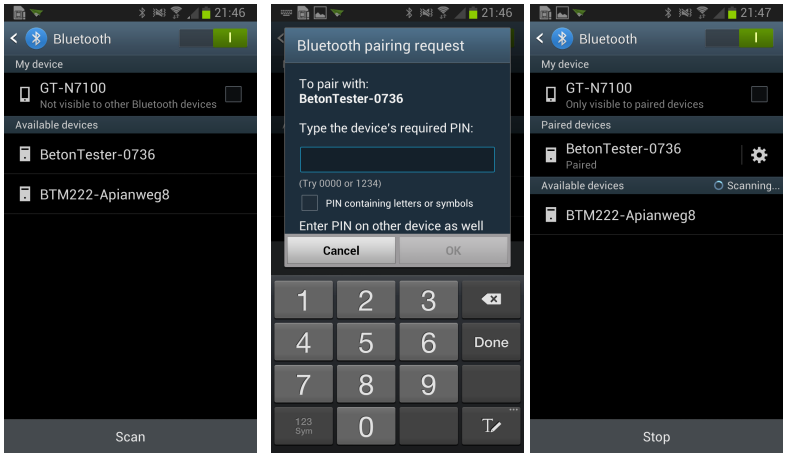
(d) Level 2 - Expert settings

Figure 34: Settings

8.1 Pairing with smartphones

On the Applications screen of the smartphone, tap Settings → Bluetooth → Scan, and detected devices are listed.

Select the device “BetonTester-XXXX”, and then enter the required PIN = 1234



(a) Searching (b) PIN input (c) Paired

Figure 35: Pairing of the eBT-V device with smartphone.

9 Technical specifications

Measurement pot P-mode diameter: 500 mm
Height of the shaft: 230 mm
Measurement pot V-mode diameter: 265 mm
Measurement pot V-mode effective diameter (incl. antislip rods): 244 mm
Specimen volume: 39.27 Liter (19.6 Liter) and 15 Liter
Length probes (P-mode): 130 mm
Vane probe, 4-blades, diameter: 103 mm; height: 103 mm
Measurement range torque: 0-10 Nm
Measurement range speed. : 0-30 rpm
Resolution angle: 2048 pro rotation
Interface to the smart phone: Bluetooth 2.0
Power supply: NiMH power rechargeable battery pack 24 V, 3600 mAh
Handling: Power switch + external smart phone (part of the delivery!)
Current Smartphone with an Android operating system

Compliance Statement: This product was tested by Schleibinger Geräte Teubert u. Greim GmbH. and found to comply with all the requirements of the EMC Directive 89/336/EEC as amended.

10 Contact to the manufacturer

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