Operation Manual

Android

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1. Product description

1.1 General description

Caleffi Balance is an instrument for pressure- and flow measurements. The intended usage is checking- and documentation of water flow in heating- and cooling constructions. Caleffi Balance consists mainly of a Measuring Sensor and a Hand Terminal including the Balance program software. The Sensor measures differential pressure as well as temperature (optional) and communicates via Bluetooth with the Hand Terminal.

The Hand Terminal software comprises data of most of the existing balancing valves on the market. From the Hand terminal list of Balancing Valves, the operator choose the actual one (manufacture, model, dimension, position), giving the corresponding KV. This valve data together with measured DP are the basics for calculation of the correct flow which will be displayed on the Hand terminal screen.

Readings of balanced values with respective valve data can be saved and later shown on the Hand Terminal screen or even on a PC screen that is connected to the Hand Terminal.

The Sensor has two connections for hoses that are to be connected over the measuring object. There is also a handle device on the Sensor for opening and closing of the measuring cell.

The Sensor has a rechargeable battery pack of 6.600 mAh. Charging is done via the enclosed battery charger.

Product description, cont'd

1.2 Unpacking.

A standard Caleffi Balance, consists of:

1. Carrying case
2. Measuring Sensor
3. Charger to Sensor
4. 2 pcs Measuring hoses.
5. 2 pcs Measuring needles
6. Allen keys
7. Manual
8. USB stick with Manual and software for Balancir Measuring program, Valve browser, Report Viewer and links to useful programs
9. Calibration protocol
10. Active license and accessories

Product description, cont'd

1.3 Technical data

Measurement Range

- Differential Pressure:	0-1000kPa.
- Static pressure:	<1000kPa
- System Temp:	-30 - +120°C

Measurement deviation

- Differential Pressure:	<0,1% of Full Scale (of calibration pressure, 100kPa)
- Flow:	as for differential pressure + valve deviation
- Temperature:	<0,2°C

Battery capacity, operating and charge time

Sensor:

- Battery Capacity:	6.600mAh
- Operating Time:	35 hours, continuous duty
- Charging Time:	6 hours

Ambient temperature for the instrument

- During operation and charging:	0 – 40°C
- During storage:	-20°C – 60°C

Humidity Ambient humidity: max 90%RH

Weight Sensor: 540gr Complete Case: 2,8kg

Open Space Range: >200m. >500m with antenna (option)

IP-class Sensor: IP65

2. Handling

The instrument Caleffi Balance is robust and easy to handle but should not be exposed to careless usage.

Avoid exposing the instrument to temperatures below zero degrees C if there is water in the Sensor.

To empty the Sensor just open the Sensor valve (by-pass position) and shake the Sensor.

If the instrument is not being used for a period, we recommend overhaul charging of Sensor.

3. Preparations - Measuring

3.1 Measuring Sensor.

Start the Sensor by pressing the *On/Off* button. A green led indicates that the Sensor with its' Bluetooth transmitter is "on".

Bluetooth connection to a Bluetooth object such as Android device is indicated by the blue led lighting.

Before connecting the Sensor to a flow system or balancing valve, an Offset calibration must be performed. See 3.2.4.2. Page 15.

Connect hoses to the Sensor's two pressure ports. Blue to blue and red to red. Connect measuring needles to hoses. Connect needles to the pressure outlets of the measuring object. Needle with red hose to pressure outlet with the higher pressure (often red marked) and needle with blue hose to the other (blue marked) outlet. After completed measurements, the Sensor is put "off" by pressing the *On/Off* button.

If the Sensor by any reason would jam or if it is not possible to come in contact with it, the *Reset* function is to be used. Push the *Reset* button to perform a soft reset.

Preparations – Measuring, cont'd

3.2 Android Device

Caleffi Balance programs for the Android operative works on Android 2.3 and up.

The App can be downloaded directly into a Smartphone or Tablet.

A telephone call does not affect the measurement program, it continues to run while other Apps or functions is handled.

N.B. A ***Soft-reset*** at a Android device is made by a re-start of the operative.

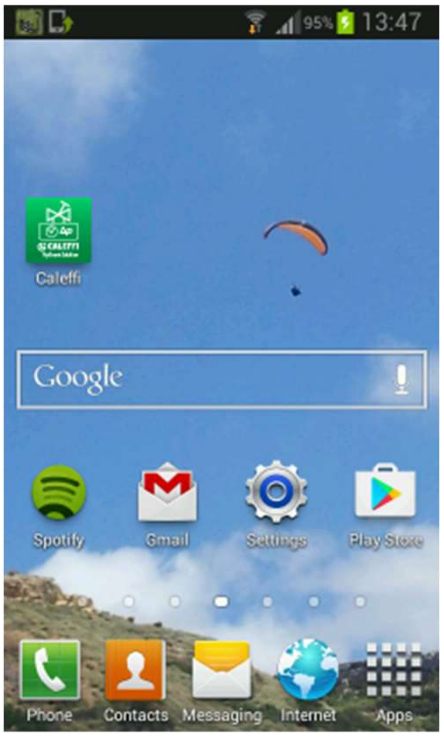
Preparations – Measuring, cont'd

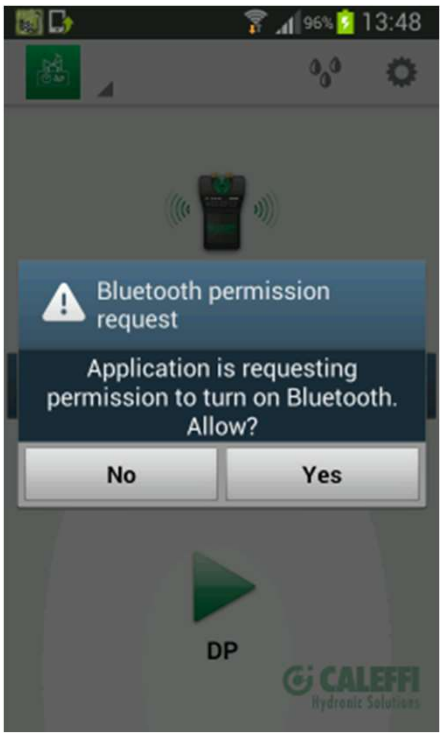
The installed Caleffi Balance App is found among the Application programs of the device.

When starting the Caleffi Balance program a Bluetooth permission request is opened, turn ON the Bluetooth at the Android device.

The main screen of the Caleffi Balance measuring program is now displayed, Connect sensor, Start Measure and DP. See page 10.

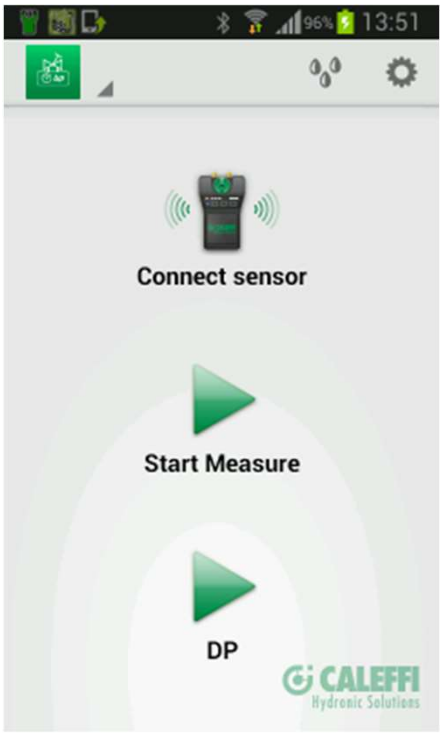
To be able to browse the complete program, turn ON the measurement sensor, then tap connect sensor and scan. The sensor ID number will appear after a few seconds, tap the sensor ID. Connection between sensor and Android device is indicated by a sound signal and a battery icon at the top of the screen. See section 4, page 19.





Preparations – Measuring, cont'd

Tap the green valve Icon and the Main Menu is opened include Categories, Function Test, Valve Data and Flow Calculator.



3.2.1 Categories.

3.2.2 Function Test.

3.2.3 Valve Data

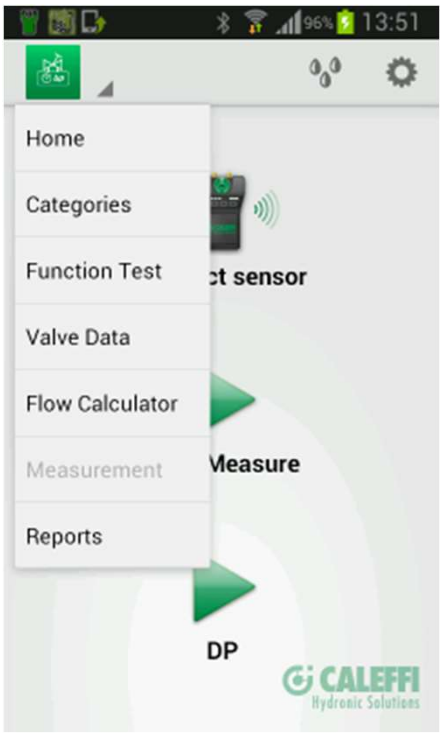
3.2.4 Flow Calculator

Also Media and Settings are located at the top bar.

3.2.5 Settings

3.2.6 Media

All these menus can be accessed at any point within the program, except at the full Graph display.
Home and Measurement are return tab's.
Also back-step at the Android device can be used to browse the program.



Preparations – Measuring, cont'd

3.2.1 Categories.

Measurement over a specific balancing valve at a site is characterized by it's Category name and it's identification number. Both Category name and ID number is free of choice.

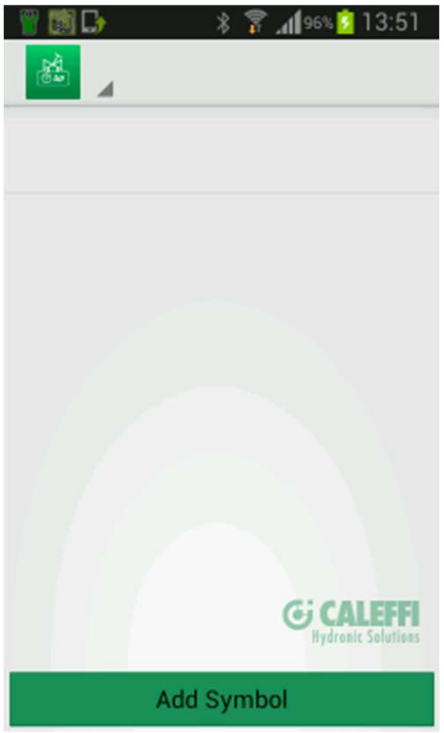
The Category name can be linked to for instance the site with an object name, Object 1, Object 2 etc.

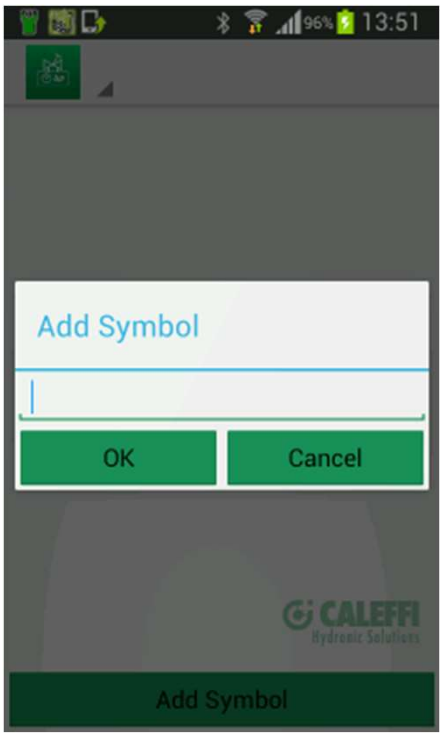
The ID number can for instance be the actual valve ID number from the blueprint or a series of numerical values, rv1, rv2, rv3, etc.

At Categories it is possible to specify category names and these Categories will then appear during the Save procedure of a valve measurement. See page 24.

When the measurements are synchronised into the PC Report Viewer program the commissioning will be filed under it's category name with the specific balancing valves as ID numbers.

The commissioning Balancing Report is generated by the Report Viewer program according to Category and ID number.





Preparations – Measuring, cont'd

3.2.2 Function Test

This menu consists of three tabs: Main, Offset calibration and Service.

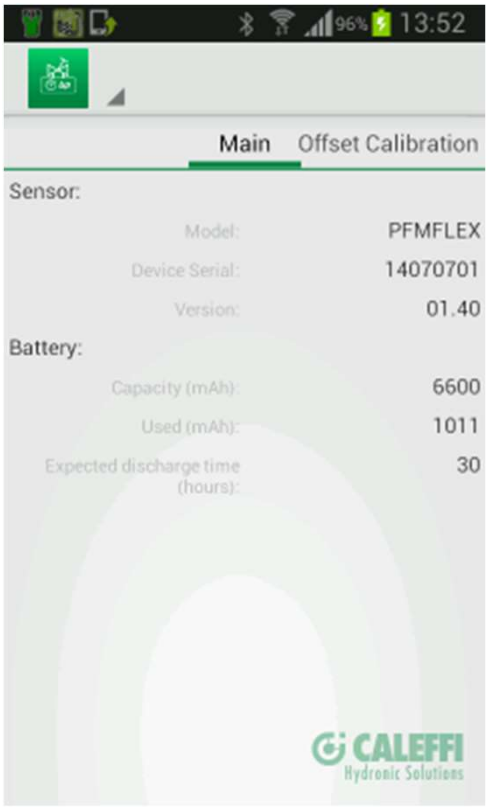
Main

Under Main Sensor Data as well as the battery status of the Sensor is displayed.

Model name, sensor serial number and program version.

Total battery capacity, used capacity and expected discharge time.

Tab and slide to the left to get to the Offset calibration tab.



Preparations – Measuring, cont'd

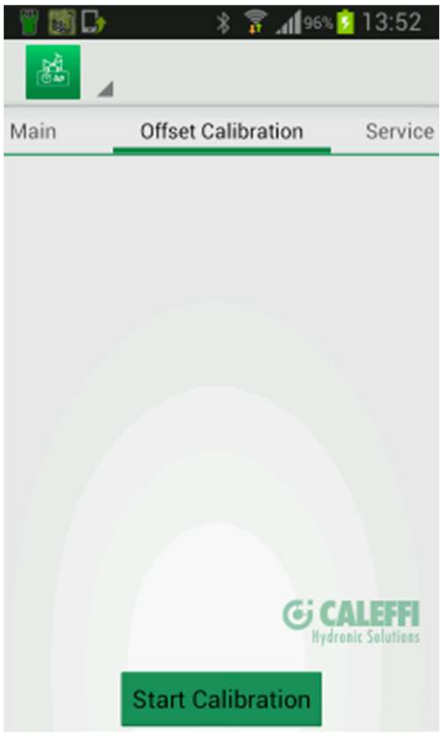
Offset calibration.

Offset calibration is performed in order to bring a correct measurement of the Static pressure in a flow system. The calibration also brings higher accuracy when measuring DiffPressure and flow.

Offset calibration is performed when a Bluetooth connection between the Android device and the Sensor is established.

The Sensor pressure ports shall be at atmospheric pressure which means that **the Sensor shall not be connected to any balancing valve or flow system.**

Start calibration by tapping *Start calibration*.



Service.

Service include Sensor specific data and constants. These are values carried by the actual Sensor and they are transferred from the Sensor to the program when connection is established.

The values are Sensor specific and differ from Sensor to Sensor.

Preparations – Measuring, cont'd

3.2.3 Valve Data.

Tap at Valve Data at Main Menu. The Valve Data screen shows all stored balancing valve measurements.

The measurements are listed according to ID number. Tap an ID number and the measurement values is displayed.

If the Android device is put horizontally both the ID list and the measurement values for a chosen valve is displayed.

To remove a measurement use the Delete function.

Preparations – Measuring, cont'd

3.2.4 Flow Calculator

At Flow Calculator a differential pressure and a chosen valve can be introduced. The position of the valve can be changed by the slide bar at the lower part of the screen.

Tap Continue and the Flow calculation from chart is displayed within a Graph.

The Flow Calculation can be opened during a measurement to check the relevance of a measured DP and Flow over the actual balancing valve.

Preparations – Measuring, cont'd

Tap and slide at the Graph to change position at the valve and check achievable Flow for a particular set up at the valve.

If the Android device is put horizontally both Graph and input frame is displayed. Tap and slide the position bar to change position at input frame and Graph.

Tap and slide at the Graph changes position and calculated Flow at only the Graph. Tap Continue at the input frame to return to original valve position.

Preparations – Measuring, cont'd

3.2.5 Settings

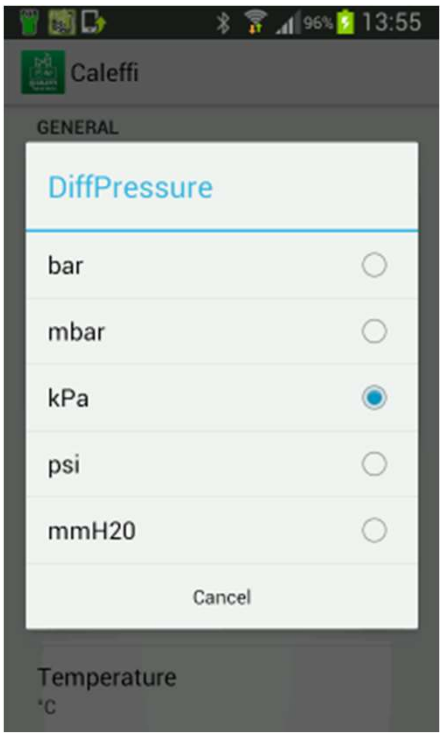
Auto Connect

If enabled the Auto Connect function automatically continuously search for a Sensor, if not the search is done once. The Sensor must be ON to be detected by the program.

Show picture

If enabled a screenshot of for instance a measurement or Graph is showed after the Save procedure of the screenshot.

Units



Settings of units for Differential pressure, Static pressure, Flow and Temperature.

About

Short information about the program.

Preparations – Measuring, cont'd

3.2.6 Media .

Media Data.

Here you find the different media that the valve manufacturer has correction factors for.

Choose Type of Media.

Choose concentration.

Manufacturer has specific correction factors within a temperature range. If measured or manually given temp is outside the range, the temp is not shown in temp area.

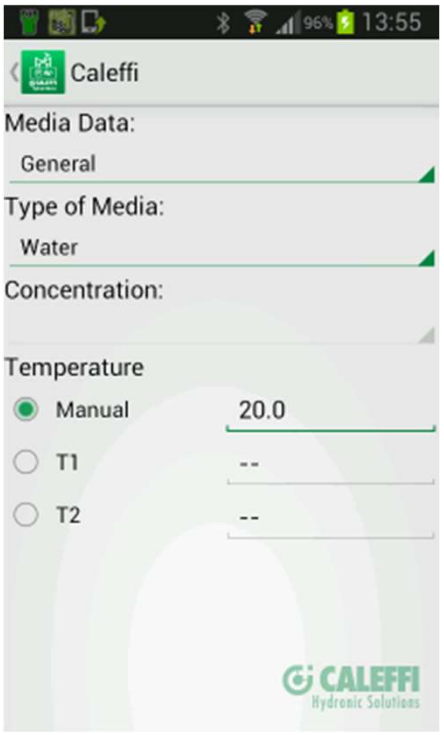
If you would like to know the temp, go back to Media Data, tap on General followed by water.

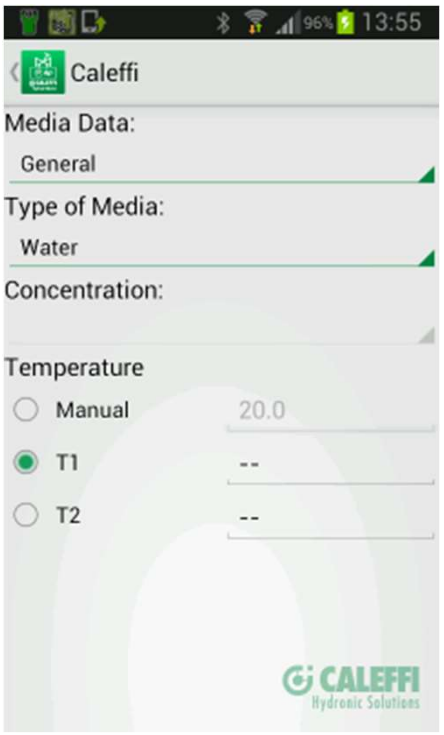
When a media correction factor is chosen it follows into the measuring window and correct the flow. If the next measurement is another media, including regular water, you must make corresponding correction.

Media menu also includes three different temperature presentations; Manual, T1 and T2.

On the left of the Measuring Sensor there are two connections for Temp probes, T1 and T2.

By using a Temp probe (option), connected to T1 or T2, you also get the temperature of the flow, presented in Media menu and in Measuring window.





4. Measuring

As all functions and settings now are completed and Offset Calibration is performed we are prepared for the measuring procedure.

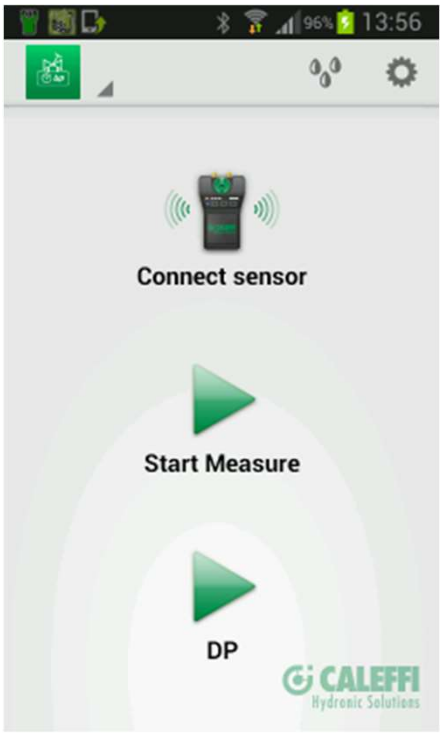
The Caleffi Balance program comprises two different measuring methods represented by *1* and *2.*

Briefly, with Measuring Method 1 is the actual and calculated flow based upon a given valve position (Kv-value) and measured DiffPressure.

With Measuring Method 2 is a valve position suggested based upon a desired flow.

Alternatively, if only DP information is required, use the “DP” short-cut”.

Tap Connect sensor, scan if necessary, then tap the ID number of the particular sensor to be connected.



Measuring – cont'd

4.1 Measuring Method 1.

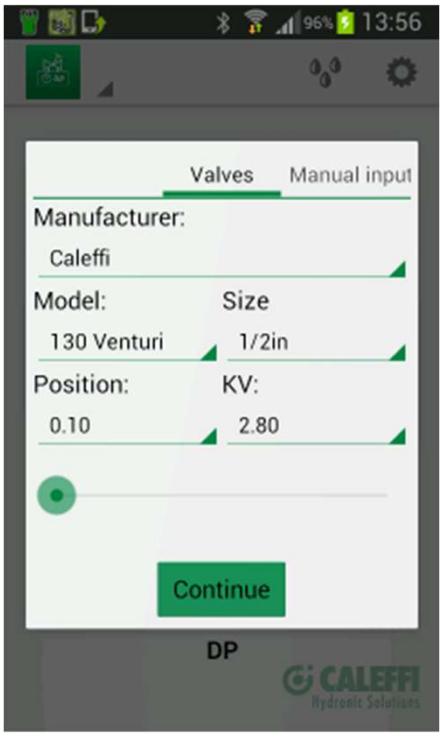
Tap Start Measure at the Caleffi Balance program display. Tap the arrow to the right of the respective areas for *Manufacturer, Model, Size,* and *Position* and make your choices.

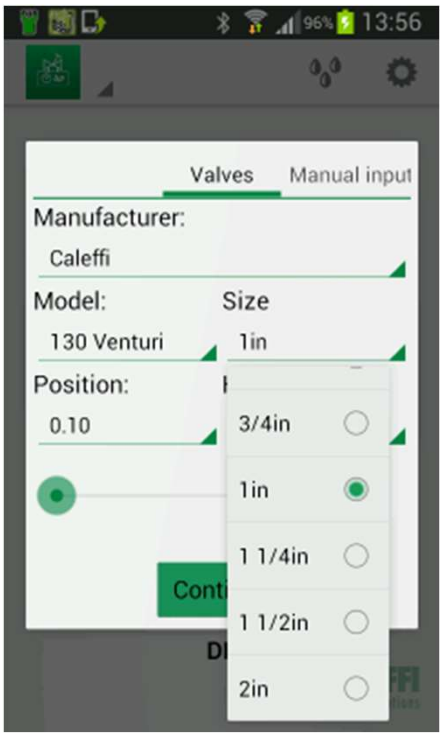
Choosing *Position* generates automatically corresponding *Kv*-value. Alternatively, choosing *Kv*-value generates automatically corresponding *Position* value.

The valve Position/Kv values can be changed by the slide bar.

If you want to state *Position* or *Kv*- value with other values then found in the drop-down list, you may use the Manual input function to enable flow calculation from a single Kv value.

When your choices are done, tap *Continue*.



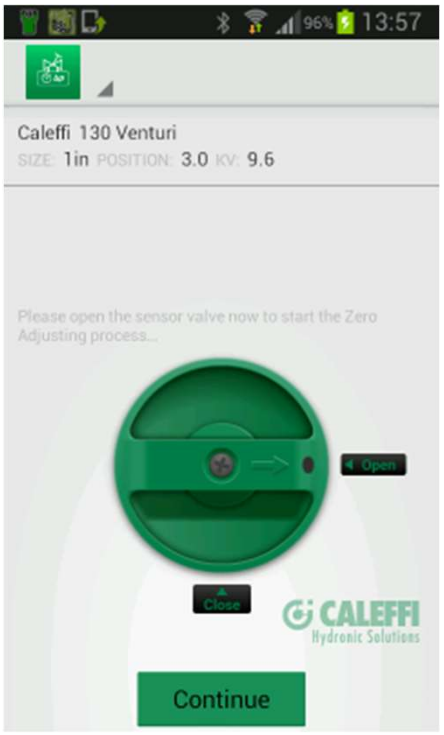


Measuring – cont’d.

Zeroing

Follow the instructions which means open the sensor valve. Zeroing is now done over the balancing valve or the measuring object.

Tap *Continue* and follow the new instruction i.e. close the sensor valve and tap *Continue*.



Measuring – cont'd.

Following the last instructions you should now have the Measurement menu visible with all data on display, measurement and valve.

On top you will see *Flow* which is calculated from the measured differential pressure (seen below *Flow*) and the actual *Position (Kv*-value). Static pressure is measured when Zeroing over the valve. If you would like to measure the Static pressure again, go to the Main menu by tapping "Back step at the device", or Home at the main menu.

Tap the circles or tap and slide the screen to move between Method 1, 2 and DP.

If a Design Flow value is at hand input this value at Design Flow and then tap Done at the keyboard. Design Flow is shown as a green horizontal line at the graphic presentation.

The Lambda value is defined as measured flow / design flow in percentage.

At the lower part of the screen; to the left a square icon that freeze the measurement values. Middle, Save measurement icon and to the right the Graphic display icon.

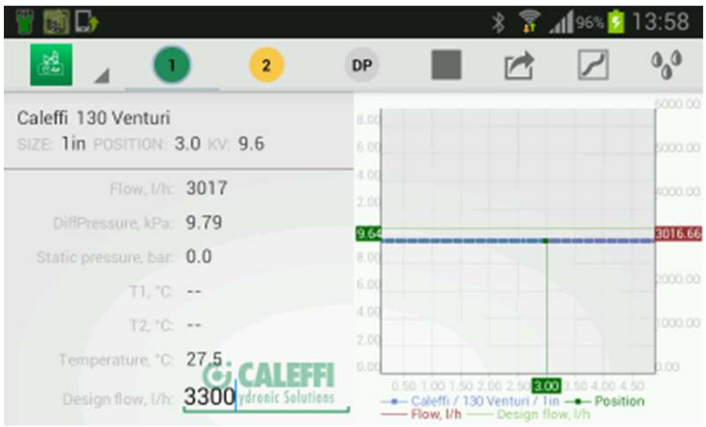
If the Android device is put horizontally both numerical and Graph screen is displayed.

Tap and slide to move between the numerical screen between Method 1, 2 and DP.

Tap and slide at the Graph to change valve Position or tap the Valve data bar at the top.

If you instead want to adjust the flow, turn the valve knob to a new position. As the position has been changed so has the KV value been changed (as well as the measured DP). This new info has to be included in calculation in order to achieve the new flow.

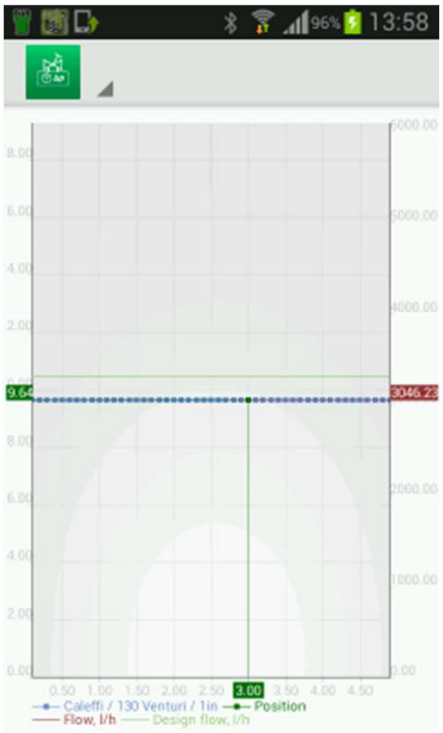
When the adjustment is completed, tap Save.



Measuring – cont'd.

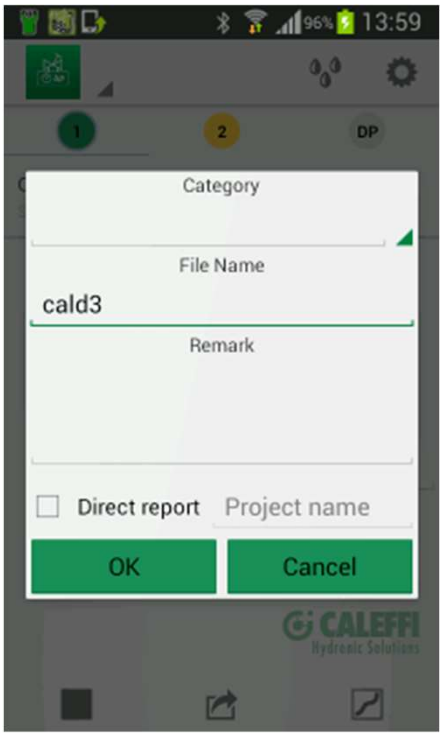
A measurement over a valve can be displayed Graphically within the frame of the valve characteristic, standing or horizontally.

Tap and slide at the Graph to change Position.



Measuring – cont'd

Tap the Save icon at the measurement screen, and a Category and ID (file name) input is displayed. Tap Category to choose a pre-set Category name. Use the keyboard to input an ID associated with the Category.



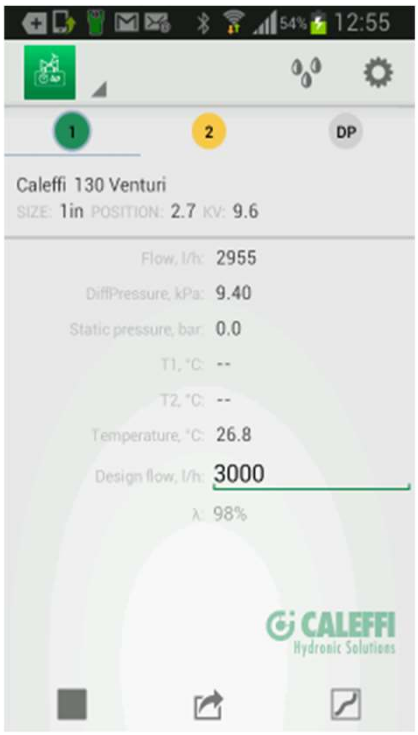
At Remarks you may add comments of your own choice. The comments will appear at the Balancing report generated by the PC Report viewer.

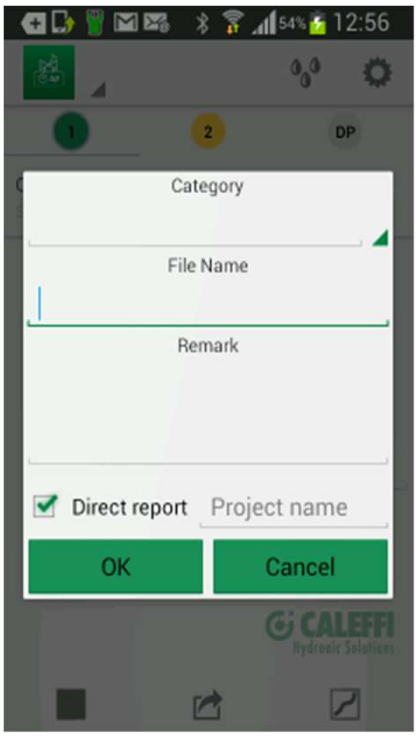
Now tap *Save* and the denominations with valve data and values are stored in the device.
Stored values etc. are available from the Main Menu's Valve Data (See Valve Data). If you don't want to save the data and values just tap *Cancel* and the Measuring screen is displayed again.

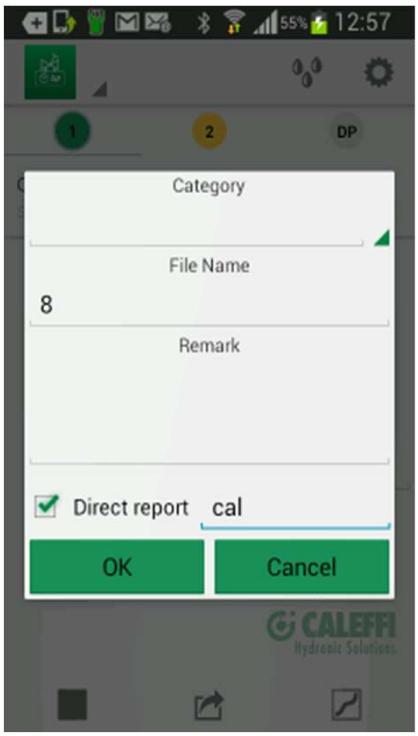
After tapping "Save" the Measuring window will be displayed and you may now start another balancing procedure as above.

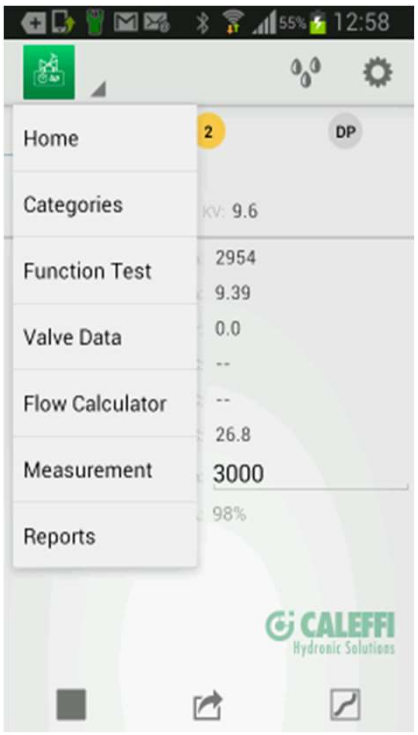
Measuring – cont'd

Use the **Direct report function** to create a Excel Balancing Report directly within the terminal, Smartphone or tablet. Tag the Direct report box. Choose File Name, for instance a number series, and choose Project name. Store the measurement. Tap Main menu and then Reports.



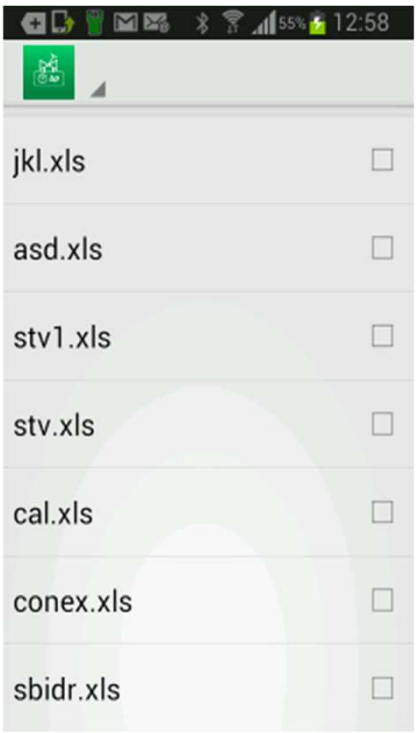


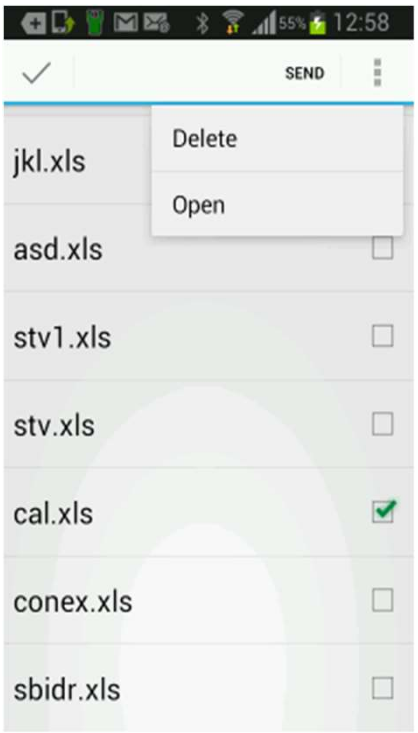


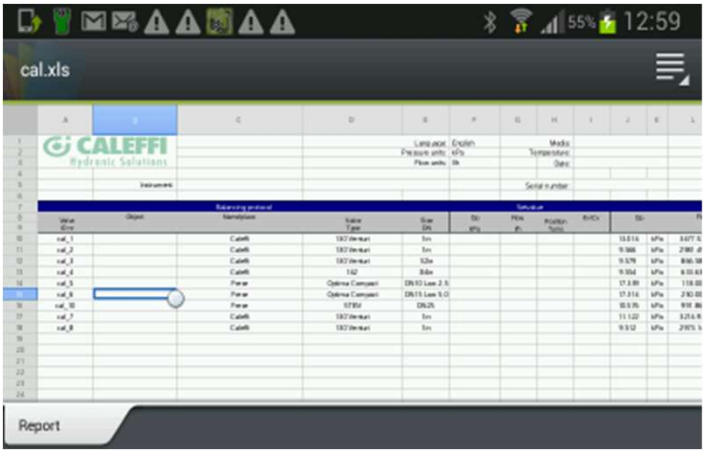


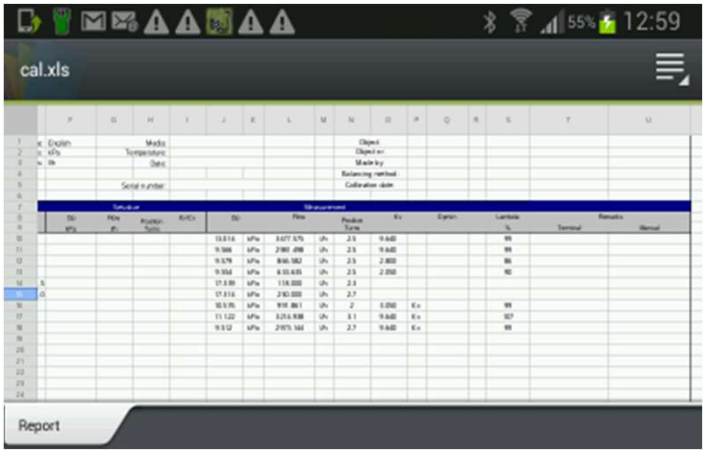
Measuring – cont'd

Tag the Project box and tap Open.
The Excel Balancing report is opened and it's possible to edit the Report at the terminal, add comments etc.



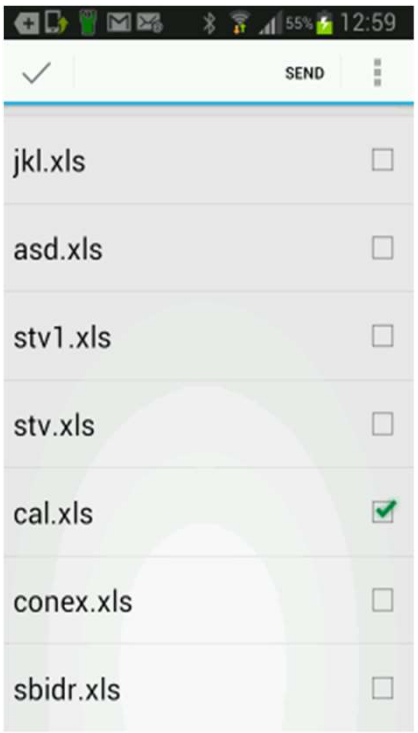




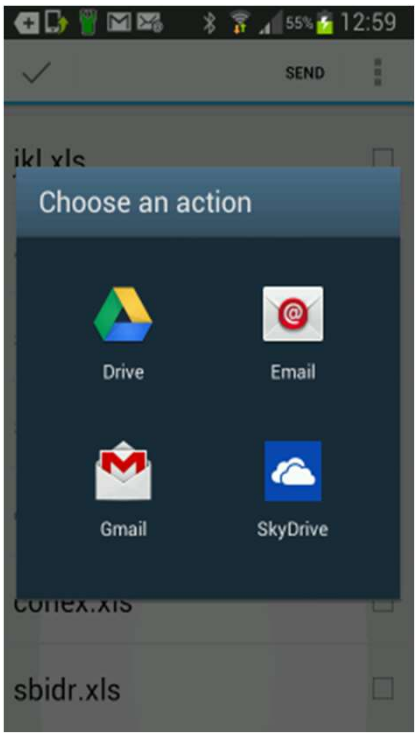


Measuring – cont'd

Tag the Project box and tap Send.



The Excel Balancing Report can be shared by email, cloud functions and other similar options, available at the Smartphone or Tablet.

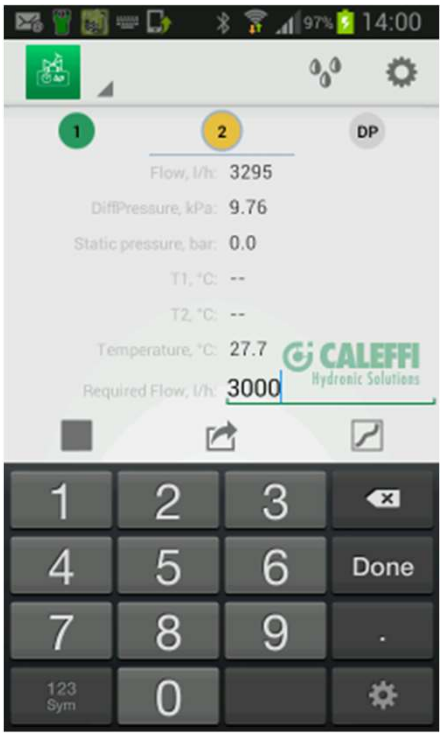


Measuring – cont'd

4.2 Measuring Method 2.

Tap or slide to Measuring Method 2.
If a pre-set Flow value is at hand input this value at Required Flow and then tap Done at the keyboard.

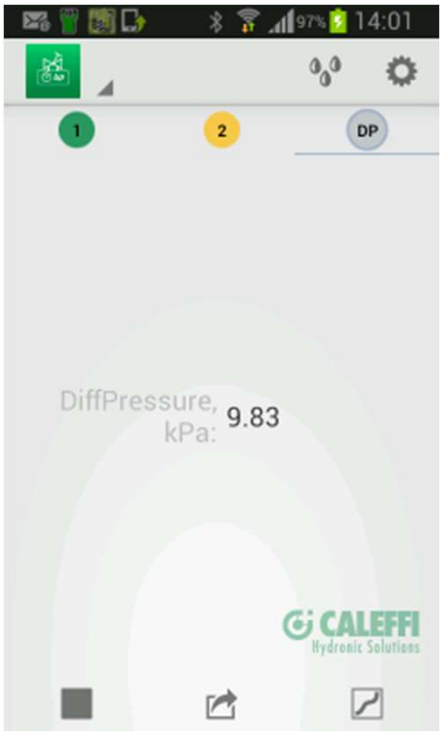
A new valve Position in accordance with the pre-set Flow is calculated.
Adjust the valve to the new Position, which will change the measured DP and Flow. Tap Done to repeat the calculation at the new Position.
Normally it takes two calculation to reach the pre-set flow i.e. if measured Flow and pre-set Flow is not to far apart.



Measuring – cont'd

The Method 2 calculation to reach a Design, pre-set Flow can be done at horizontal device mode, which display the measurement as both numerical values and Graph.

The DP screen only display DP and there is a short-cut at the opening screen to the DP measurement.
No valve manufacturer, model, size and position input has to be made when using this short-cut.



5. Transferring of data - Hand Terminal to/from PC.

Data that has been stored in the Hand Terminal is available under *Valve Data*.

Valve Data is easily transferred to PC for further processing as transcription etc.

A USB stick containing, for instance, *Support* is included in each complete Caleffi Balance.

The ”Support” program package enclose two different programs; *Valve Browser* and *Report Viewer (RV)*.

The programs are downloaded from USB stick to PC as usual i.e. put the USB stick into the PC disc drive, click at *Support* and follow the instructions. Short cuts are automatically created at the desktop ”Report Viewer", "Valve Browser” and “Projects” (folder for saved measuring and reports).

Valve Browser is a graphic based valve display program. Position – KV curves are given for a vast number of valves from different manufacturers.

The program has 3 windows. *Valves*, where manufacturer, model and size is chosen. The graphical presentation of the chosen valve is displayed to the right. A theoretic differential pressure is stated at the upper rim of the graph. By clicking somewhere at the curve, flow and corresponding position and KV is displayed in yellow boxes. Flow at the right y-axis, position on the x-axis and KV at the left y-axis. A position may be saved by clicking *Save to History* and the actual valve settings is listed at the window below the graph. The Valve Browser is a unique information tool for getting expected values of flow under theoretical conditions of DiffPressure and position.

Report Viewer (RV) is the only program needed for creating and saving reports. To the left there is an area for all valves (measurements) that has been transferred from the Hand Terminals savings to the Report Viewer (IN-data). To the right you see the complete data of one of the valves from the left side. Tap on a valve on the left side and the valve’s complete data is displayed in the right window. The left side valves are organized as a Windows-tree-structure and could consequently be managed with Windows commands (for example click right on mouse for creating a new folder when the cursor is in this area).

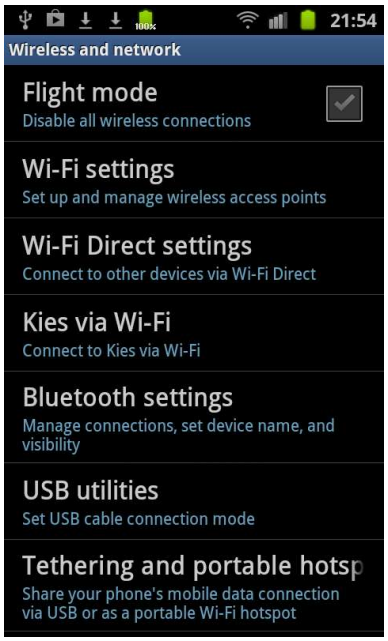
The top bar icons are described in the following pages.

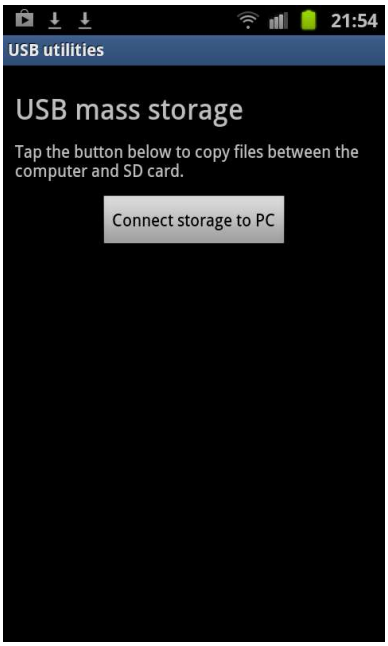
Transferring data to/from Hand Terminal to PC – cont'd

To transfer measurement data from Android Mobile to PC Report Viewer (RV)synchronize the terminal with the PC or Laptop. MTP (Media Transfer Protocol) synchronization is done automatically when a cable is connected between the Smartphone or tablet and the PC/laptop USB port.

At older Android operatives a USB synchronization can be done, according to the following schedule.

1. Connect the USB cable to the Laptop
2. Tap Settings/Wireless and network/USB utilities
3. Tap "Connect storage to PC"
4. Connect the USB cable to the Mobile
5. Tap "Connect USB Storage"



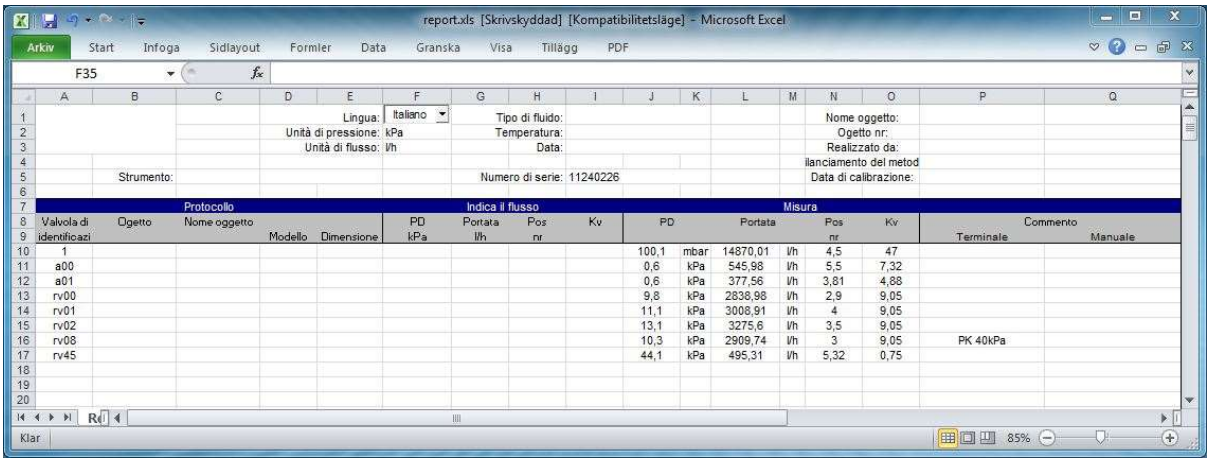


Transferring data to/from Hand Terminal to PC – cont'd

Measurements are identified by their Category name and the valve ID.

Transferring data to/from Hand Terminal to PC – cont'd

After the field measurement has been done, synchronize the Android device/Mobile with the PC/Laptop and data will automatically transfer to the RV program.
To create the Excel Balance report tag the boxes at the ID icon of the specific Category and then click at Report at the top FV bar and a excel balancing report is opened..
To organize measurement in a tree structure, click right with the mouse at the RV list area to create a folder. Tap, tag and drag measurements into the folder.



6, 7 Hand Terminals and accessories.

6. Using several Android devices

Any Android device having the Caleffi Balance Measuring program downloaded may use the same Sensor. This might be advantageous in an organization comprised by operators having their own Smart Phones.

For additional App downloads please contact the supplier.

7. Accessories.

Caleffi offers extra accessories and parts. Please contact your supplier for information.

8, 9 Upgrading and calibration.

8. Upgrading.

The Caleffi Balance App is programmed with data of most of the existing balancing valves on the market. The same data is also stored on the Caleffi USB stick; *Support, Valve Data.*

If you need to upgrade your App program with new valves data that can be done directly into the device and it's free of charge.

If in doubt regarding the download procedure contact your supplier.

9. Calibration.

The EU has issued instructions and recommendations for calibration of this kind of instruments. On the Measuring Sensor there is a label indicating when the Instrument was calibrated last time and when it should be calibrated the next time. According to the AMA code, the date of calibration is to be mentioned in all balancing reports. Caleffi has of course the organisation to effect the necessary calibration as well as any other service of the instruments.

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