User Manual: WeSense™ for Android

From now on, your smartphone is a power quality analyzer.

About this guide

Note:
Please note that this guide is not always up to date. If, for example, you have changed the firmware of the device over the Internet to a later firmware version, this description may no longer apply in every respect.
In this case, please contact us directly or use the latest version of the user guide available via our website (www.a-eberle.de).

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User guide v2.00
Date 03.03.2017
App version v4.1.29
Hardware v1.00 WeSense™ for Android

Notes

Warnings

Classification of warnings
Warnings differ according to the type of danger, classified by the following signal words:
→ **Danger** means there is a danger to life
→ **Warning** means there is a risk of physical injury
→ **Caution** means there is a risk of damage to property

Examples:

 Signal word	Type and source of danger Measure to avoid the risk.
 Note	Note on proper handling of device

Product profile

Power quality for low voltages

- Basic measuring device for voltage quality
- PQ detection at each socket
- Slim, inexpensive tool
- Simple and easy-to-understand presentation
- Fast diagnostics for a wide audience

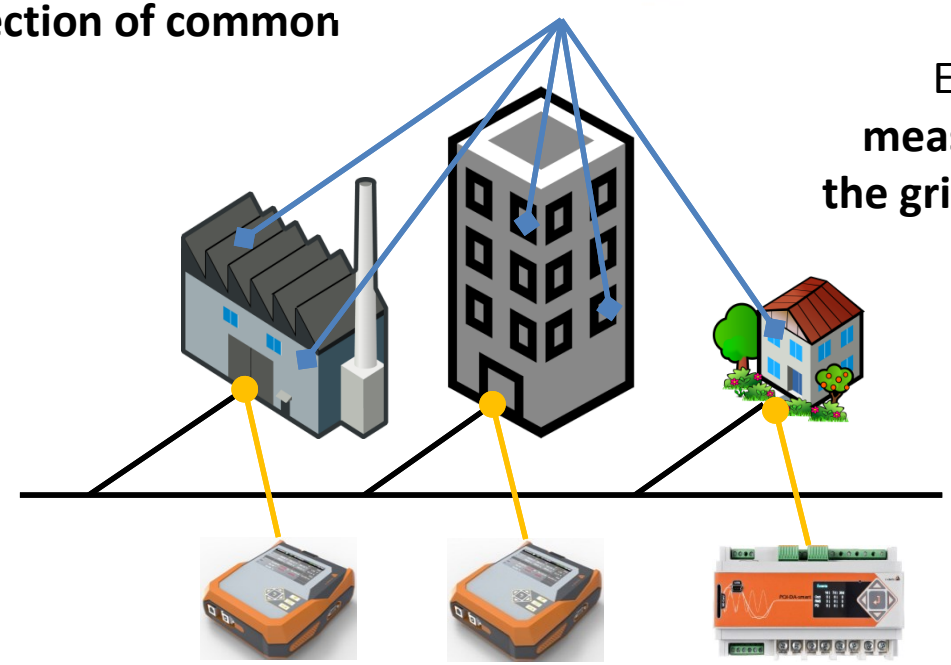
Videos, info, news, and articles can be found on the product homepage www.wesense-app.com

Applications

Use as a single device

Online measurement of grid status/grid quality within industria office and residential buildings

Fast on-site detection of common grid faults

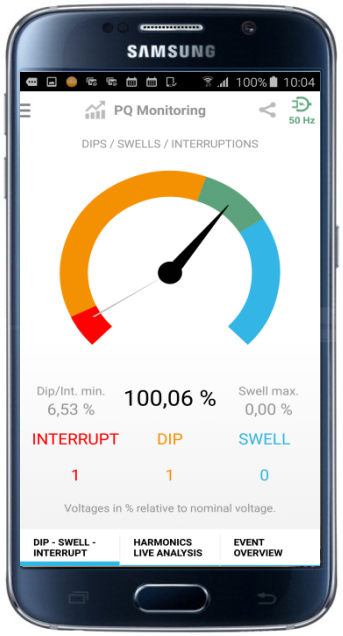


Use in combination with other devices

e.g. with classic power quality analysers at the mains connection point.

Enhances your view by **measuring in the depth of the grid and facilitates error location.**

WeSense™ system overview



Charger
Charge and measure at the same time

*as per USB charging standard BC1.2

Android App
Evaluation and presentation

WeSense™ power quality adapter

Hardware

Measurement/charging function

- Sampling rate 10 kHz
- Highly accurate voltage measurement
- Fast charging at up to 1.5 A for devices that support USB battery charging standard 1.2*

Electrical properties

Input voltage, nominal	100 … 240 VAC
Input voltage, max.	90 … 264 VAC
Input frequency	47 … 63 Hz
Temperature (operation)	0 … 40° C
Temperature (storage)	-20 … 70° C
Output data USB	5.1 V / 1500 mA / max. 7.5 W

* Note: No charging of tablets in the Samsung Galaxy Tab range

Safety instructions, environmental information

Safe use

Do not store the measurement adapter in very smoky or dusty environments and do not expose it to moisture. Do not subject the device to strong vibrations or jolts. Do not use the device if damaged. For indoor use only. Gross disregard of these usage guidelines may lead to a dangerous situation arising.

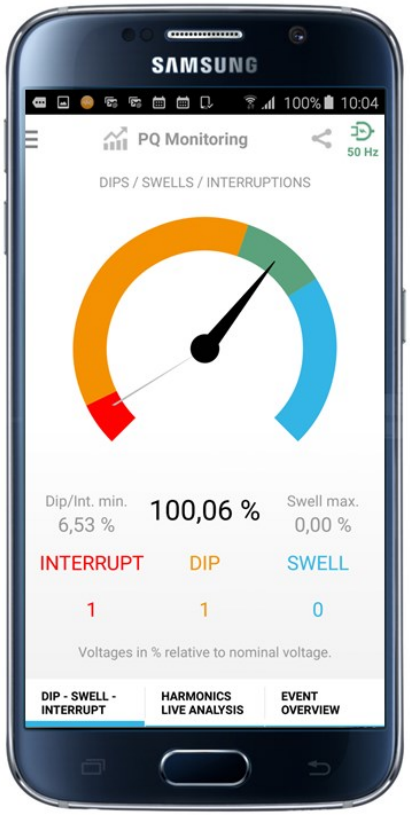
CE

We hereby declare that this device carries CE marking according to the regulations and specifications. It therefore complies with the essential requirements of EMC Directive 2014/30/EU and the Low Voltage Directive 2014/35/EU.

Environmental protection

From the date of transposition of European Directives 2002/96/EC and 2006/66/EC into national law, the following applies: Electrical and electronic equipment must not be disposed of with household waste. The consumer is legally obliged to return electrical and electronic devices, as well as batteries, at the end of their service life to the designated collection points or to the point of sale. Details of this are governed by the respective national law. The symbol on the product, the instruction manual or the packaging indicates these requirements. By recovering, recycling the materials or by otherwise recycling old equipment, you are making an important contribution to the protection of our environment.

WeSense™ app



App functions

- Automatic grid detection 50 Hz / 60 Hz
- Live display of voltage, mains frequency, harmonics
- PQ analysis with threshold monitoring :
  - Dips, swells, interrupts
  - Oscillations (odd, up to H15)
  - PQ event list / logbook
- Easily export data via "Share" function
- Send continuous recording of up to 36 hours via email or similar.

System requirements

- Executable on Android OS v4.0 (Android 5.0 or higher recommended)
- Optimal results:
  Samsung Galaxy range from S5 and Android 5.0 or later

We take care of it.

a-eberle

WeSense™ start-up

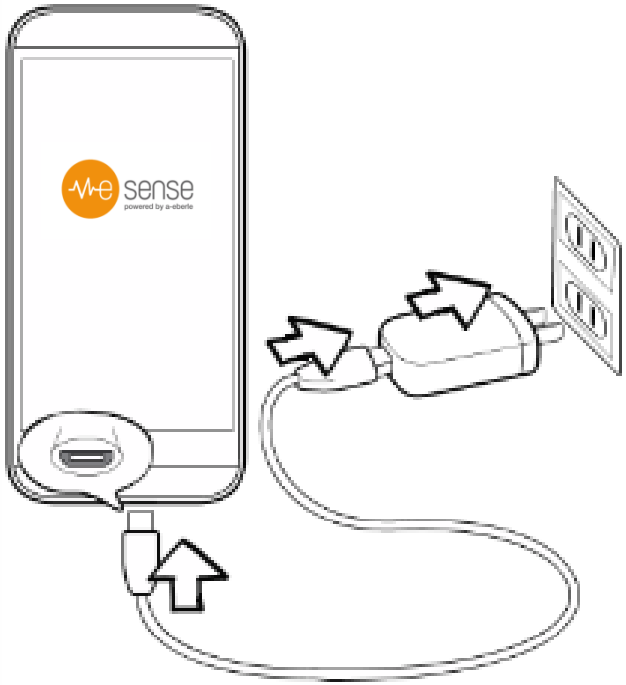
1. Install WeSense™ app directly from the Google Play Store (use link in QR code)

https://play.google.com/store/apps/details?id=com.aeberle.wesense&hl=de

2. Using USB cable supplied, connect WeSense™ adapter and (for example) smartphone.

3. Insert WeSense™ adapter in socket

4. App and measurement commences automatically.



ANDROID APP ON Google play

WeSense™ in Google Play Store

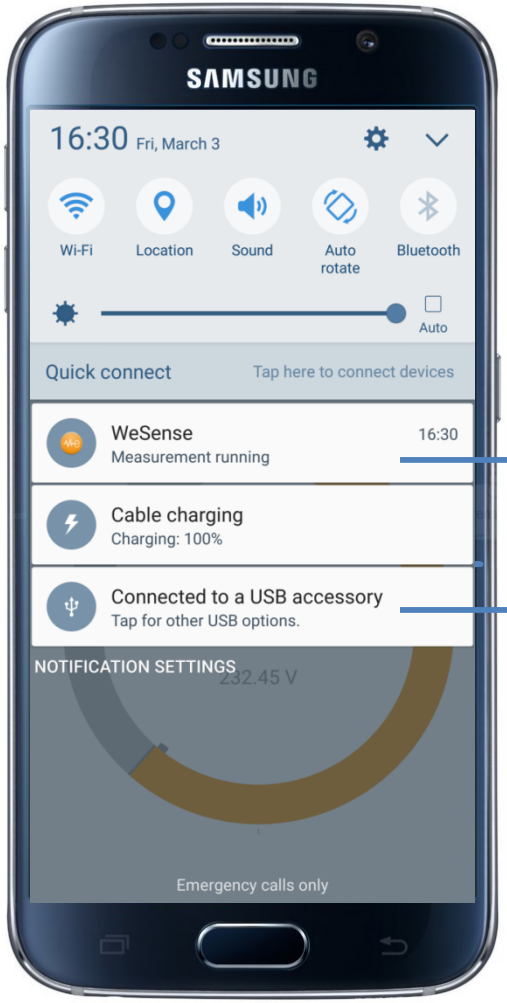
Or navigate to this address via your smartphone's browser
http://bit.ly/wesense_de

Launching app and measurement

After plugging in the WeSense™ charger, the app launches automatically

- ✓ Info: Data service runs in the background
- ✓ App opens in "analogue instrument/ voltage-measurement" view

The WeSense™ app is running: How to recognise it (2)

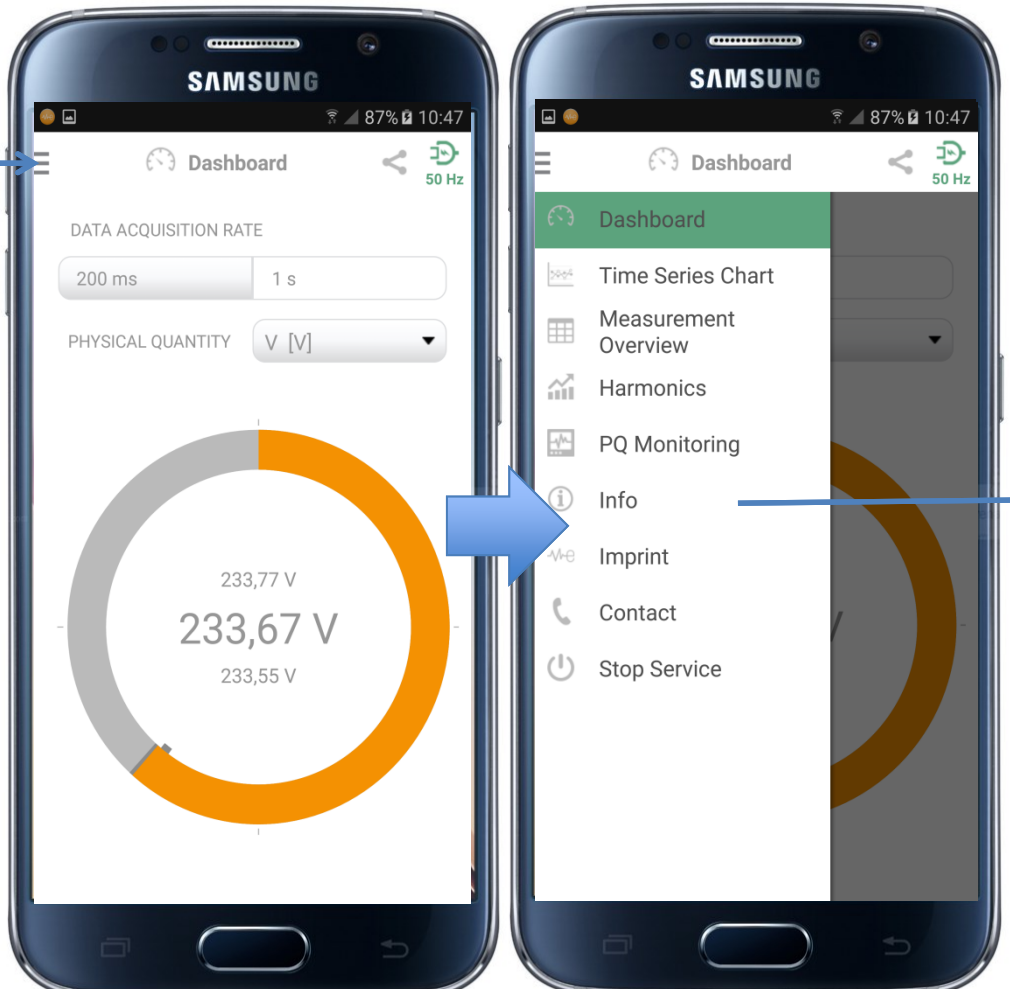


Detailed information can be found in the notification area on your phone:

- ✓ The background service for data transmission is running.
- ✓ The charger is connected via USB cable and your device is compatible with the supported USB charging modes.

In-app navigation

Open app menu

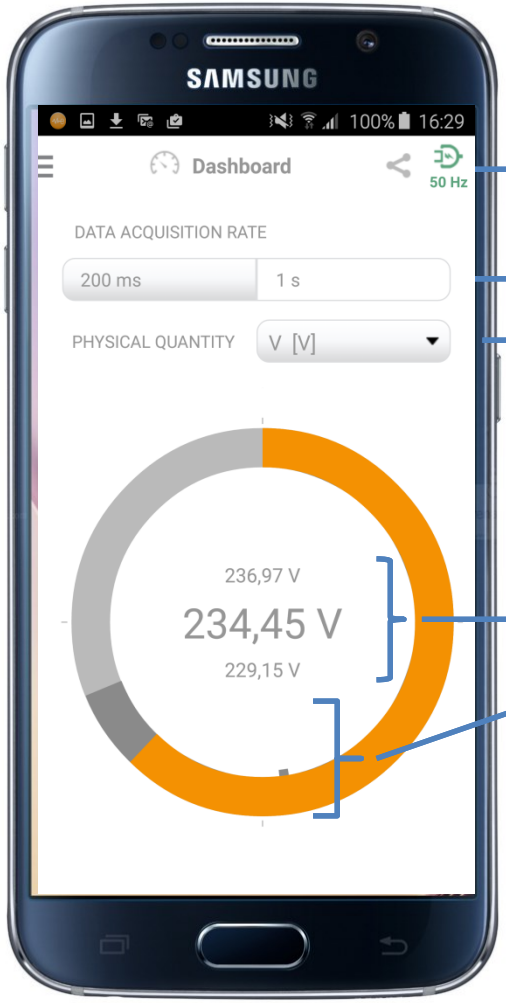


You can go to any screen using the sidebar

App function:
Explanation of app screens

App screen:
Dashboard – the analogue instrument for online values

For displaying online values



Info: Grid detection 50Hz / 60Hz

Selection of data class 200ms / 1s RMS values*

Selection of measured value:

V, f	**(200 ms and 1 s)**
Hx	**(1 s only)**

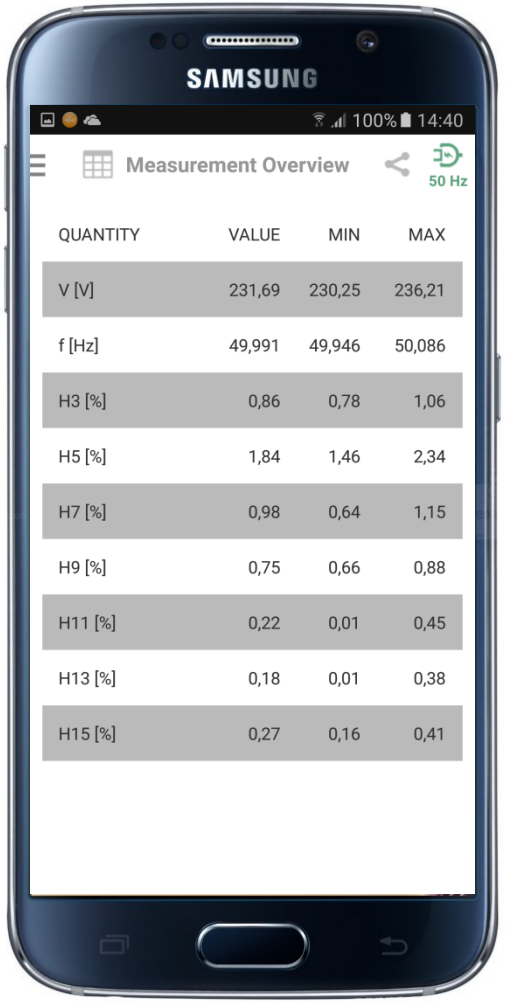
Max. value (of needle since plug-in)

Current value

Min. value (of needle since plug-in)

*** Note:** For the sake of simplicity, measured values are sometimes declared as "200 ms or 1 s RMS". In fact, the app uses highly accurate zero-crossing-synchronous data processing. Thus the measured values are *actually "10T / 12T" or "50T / 60T" RMS values*. T is the length of a grid period in this case.

App function: Measurement overview

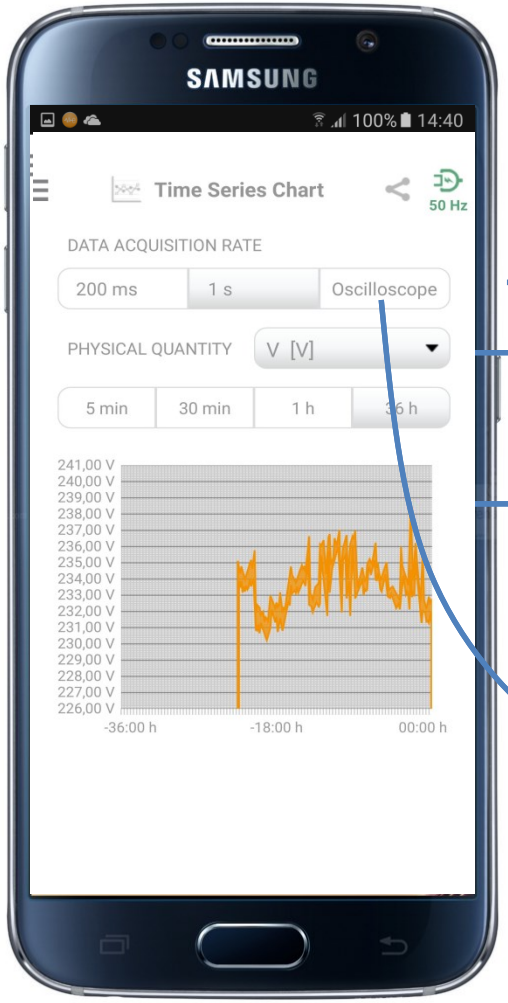


Overview of all measured values

Live display of all measured values

- Current value
- Max./min. values since plug-in

App function:
Display long-term data



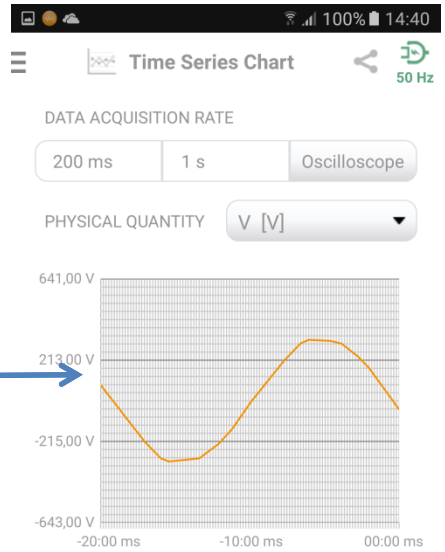
Technical info: 36 hours ring buffer for 1s data
2 hours ring buffer for 200 ms data

Selection of data class / oscilloscope

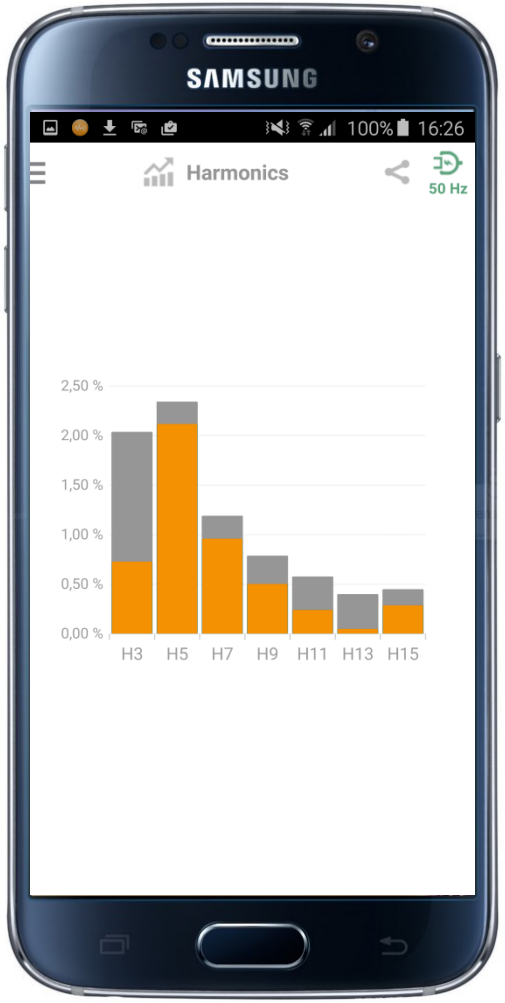
Select: measured variables over time

Auto-scaling +
zoomable with two fingers

Oscilloscope display



App function:
Online harmonics display



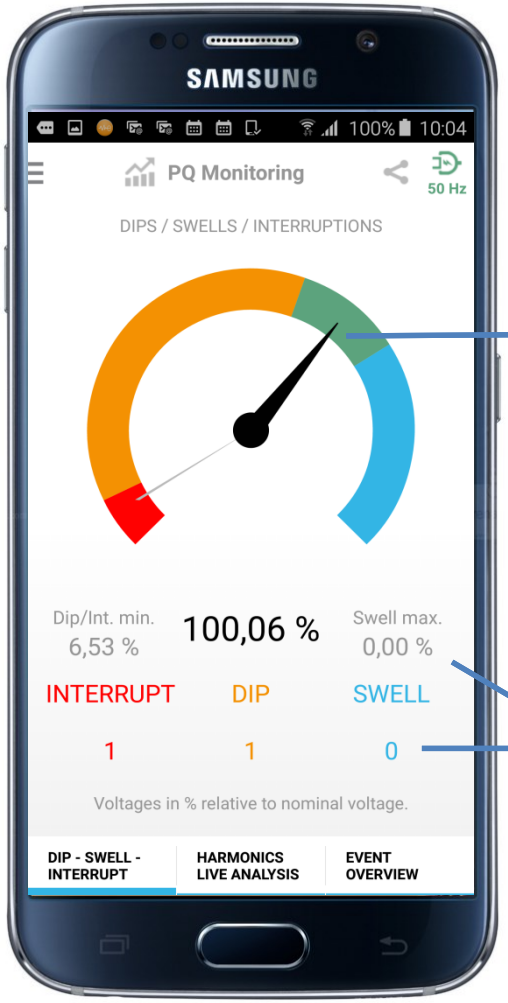
The most important harmonics at a glance

Live display of all measured values

- Current value
- Max./min. values since plug-in (grey)

In general, especially H15 is critical (limit: 0.5 %)

App function:
PQ analysis – dip/swell/interrupt



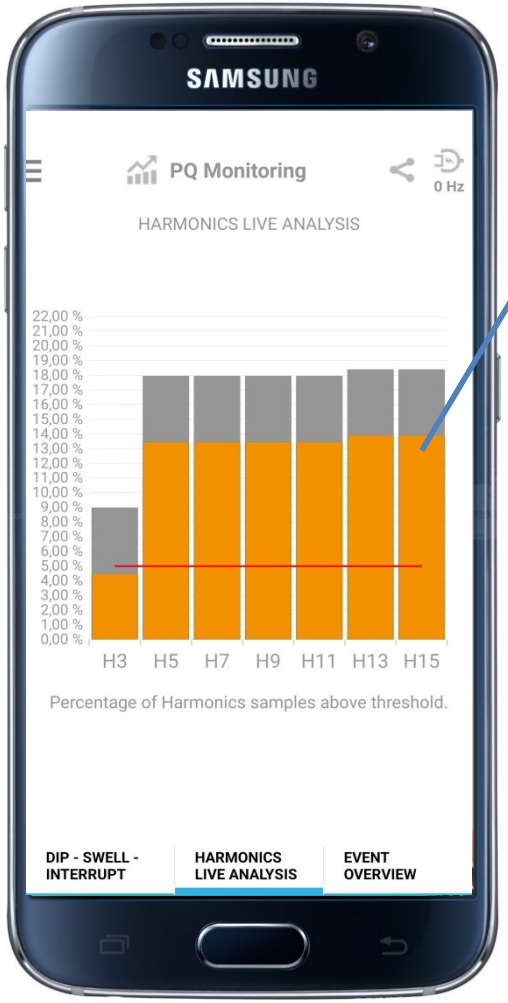
For evaluation of short-term voltage deviations
(Evaluation period starts on plug-in)
Evaluation of voltage: every 10ms, on mains-cycle basis ("20ms")

Live display of 200 ms voltage value
(half-period values, normalised to 230 V or 110 V)

OK	90% < V < 110%
DIP	10 % < V < 90 %
INTERRUPT	V < 10 %
SWELL	V > 110 %

PQ event counter
Global display of min./max.
Graphical needle for events since plug-in

App function:
PQ analysis – harmonics



For threshold monitoring of harmonics

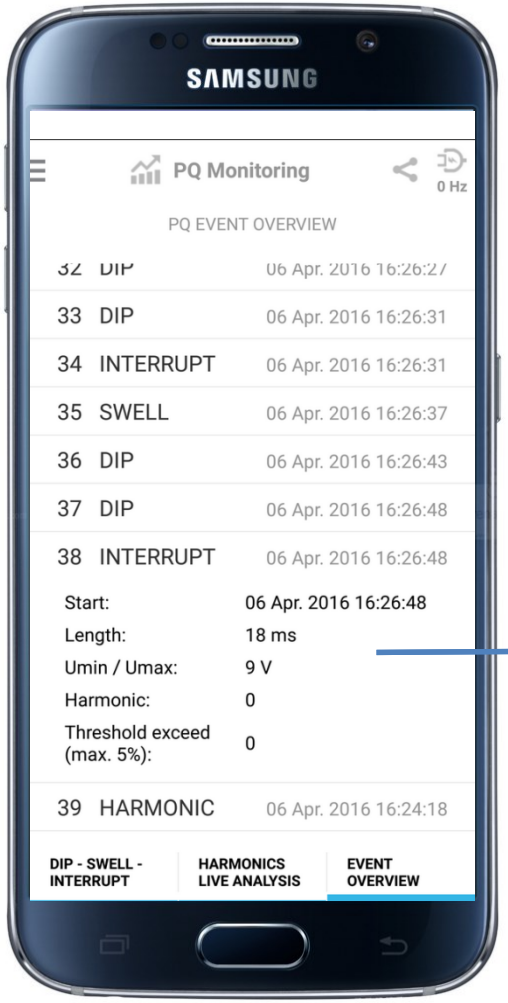
Live display:
Percentage of measured Hx values, which were <u>above</u> the relevant EN50160 threshold (1s RMS values)

EN 50160 thresholds applied:

H3	5 %	**H5**	6 %	**H7**	5 %
H9	1.5 %	**H11**	3.5 %	**H13**	3.0 %
H15	0.5 %				

A PQ breach is deemed to exist if **>5% of the measured values are above the threshold** <u>when the charger is unplugged (end of measurement period)</u>

App function: PQ logbook



Overview of all PQ events / breaches since the last time the charger was plugged in or unplugged:

- Dips
- Swells
- Interrupts
- Harmonics

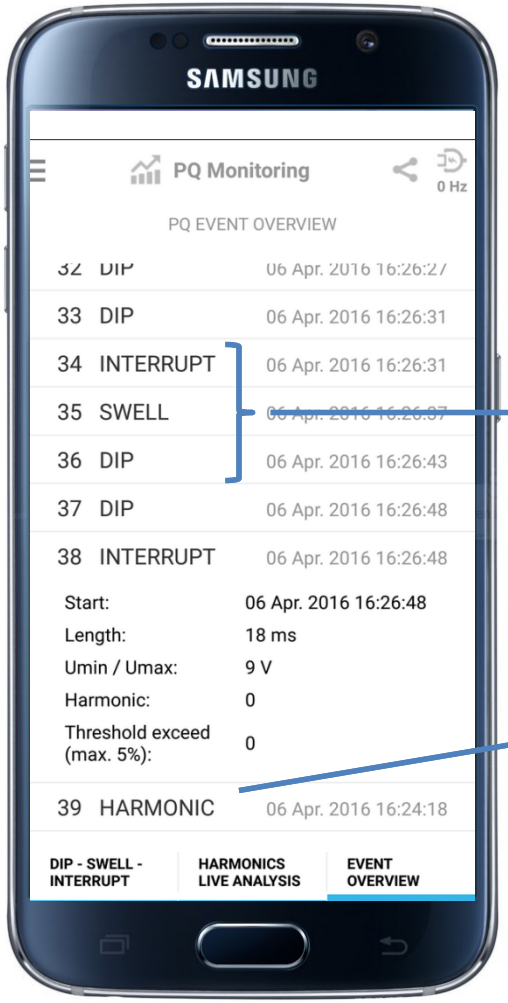
Tap on an event → Details

Time stamp

Event length

Min./max. value, which harmonic

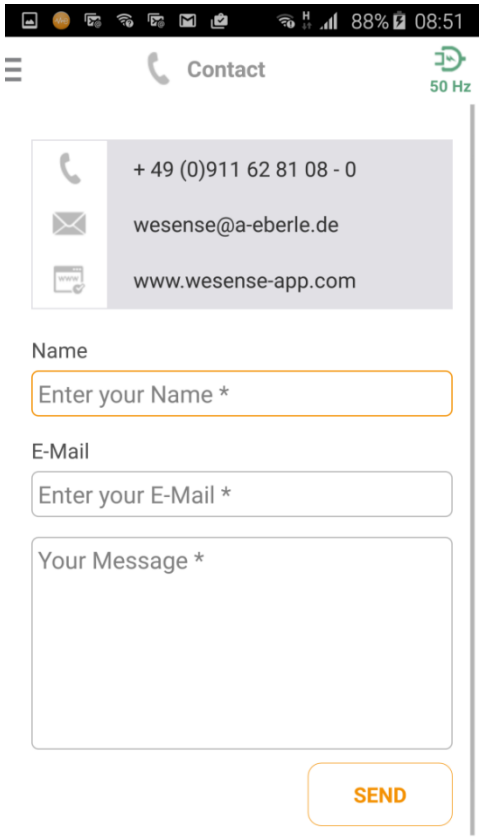
PQ logbook – differentiation of PQ events



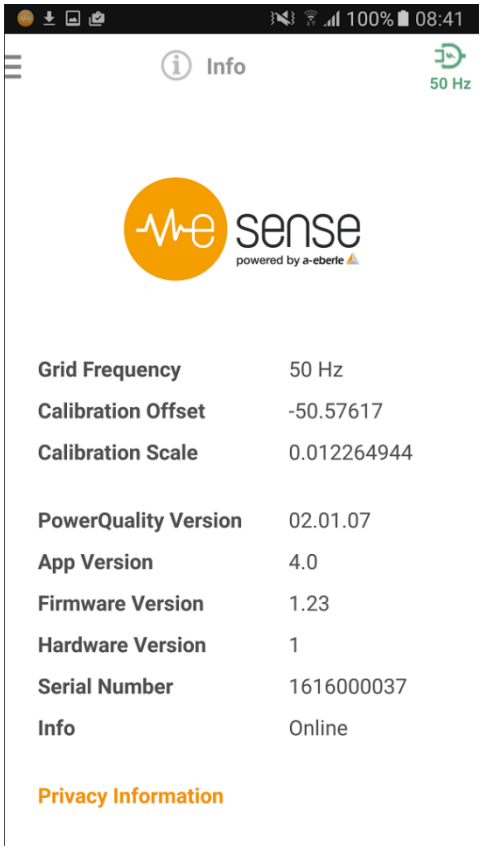
Dips / swells / interrupts: "Instantaneous voltage events" They appear on the list immediately upon occurrence.

Harmonic events: The measurement situation at the end of the measurement period matters. At the instant the charger is unplugged, an internal evaluation is made. Are more than 5% of the detected 1s values above the limit value for a given Hx? If that is the case, a harmonic event is reported. This means that harmonic events are reported only after unplugging!

Useful information



Contact a-eberle by email

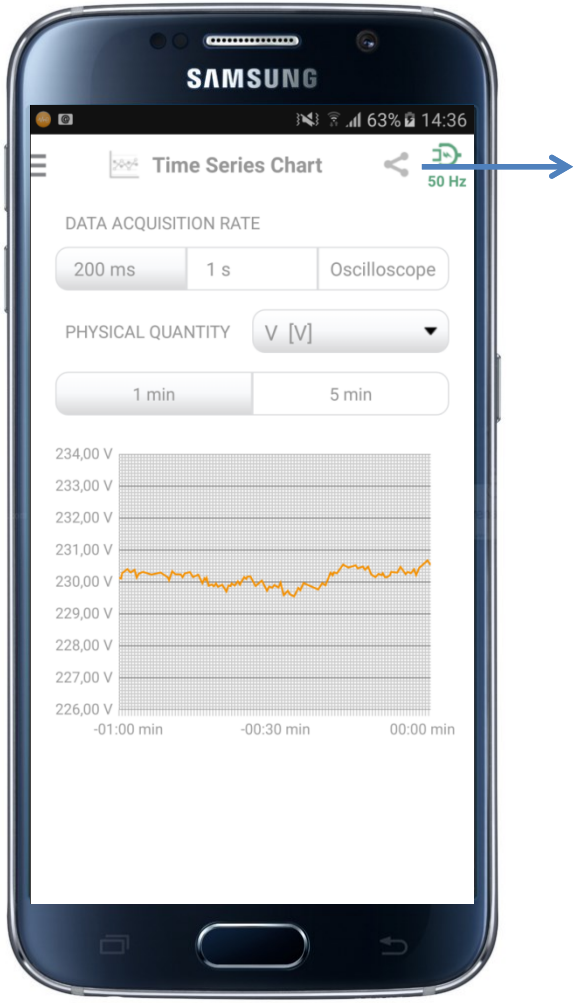


Info page with version numbers

Company details

App function: exporting data

Exporting data

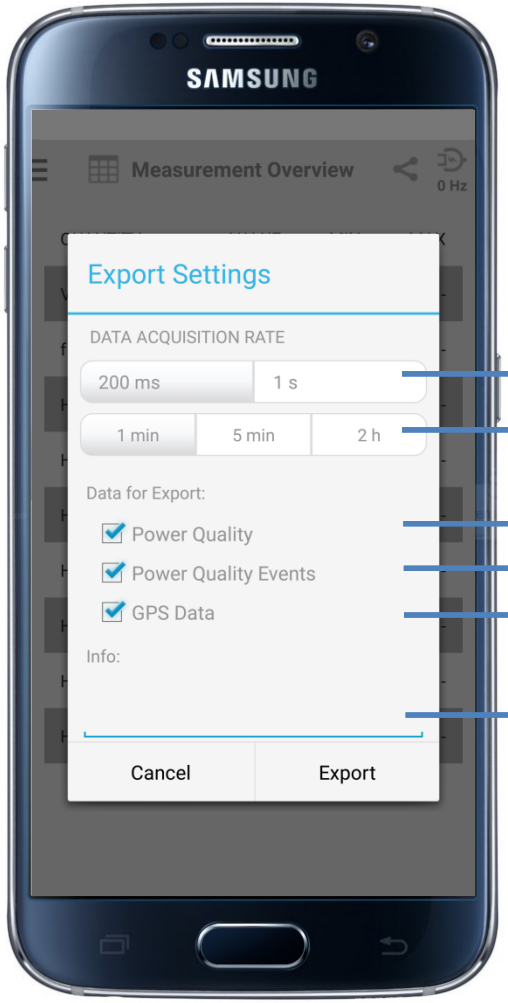


By tapping on the "Android Share" icon, data can be exported.

The following is exported:

- A screenshot of the current screen
- The contents of the running internal data memory (200 ms or 1s measured values)
- Any PQ event which has occurred
- A recording of the position of the device.

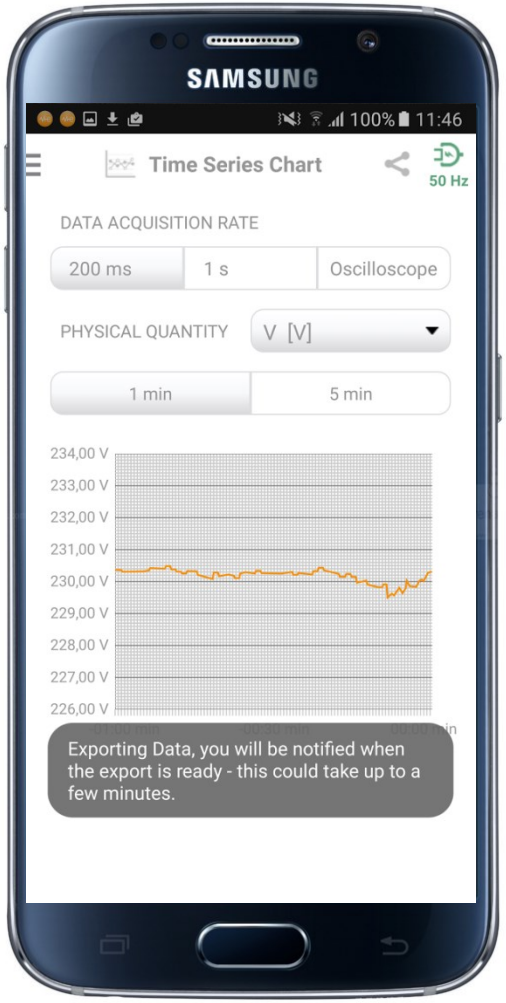
App function: Restricting data export



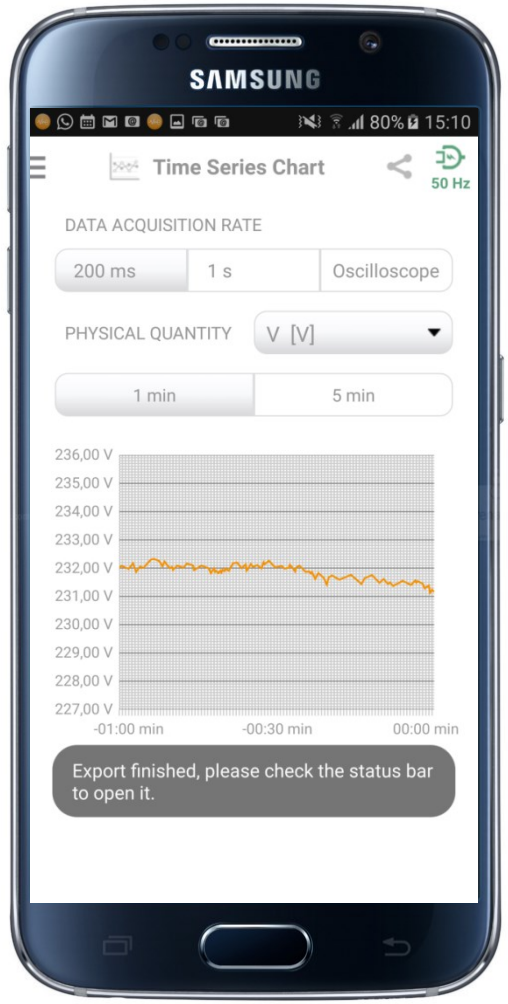
Note: Exporting large amounts of raw data can significantly burden the resources of less powerful phones in particular, and may take some time. Therefore, a dialogue box is opened which allows the user to restrict the data to be exported.

- Selection of data class
- Selection of time span: last x min / last x hours
- Export ring buffer (complete, CSV list)
- Export PQ events, CSV list
- Export GPS location of device, CSV list
- Optional comment field for description

App function:
Data export running in background

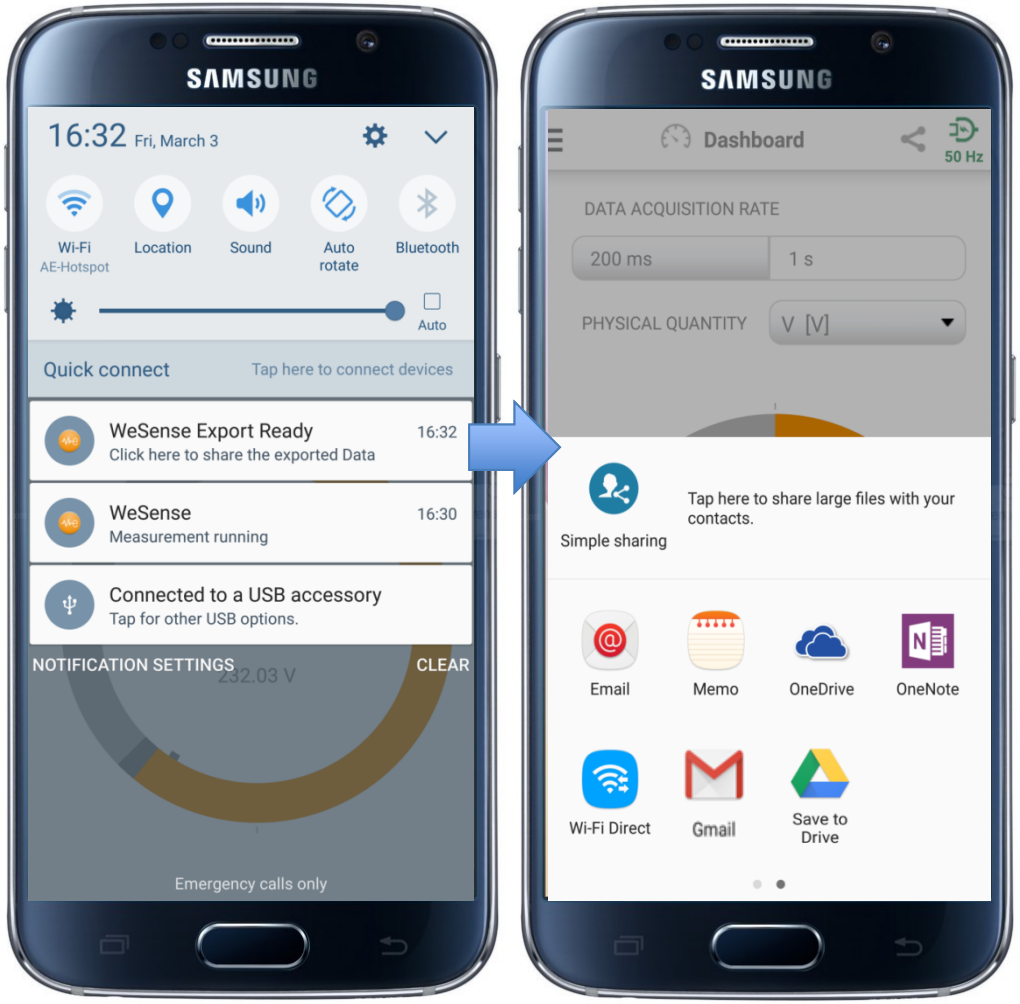


Note: The maximum exported timespan is up to 36 hours, depending on the selection. The export operation will run as a background task and can take a few minutes, especially on slower devices.
Start and end of this process is indicated by means of corresponding popup messages.



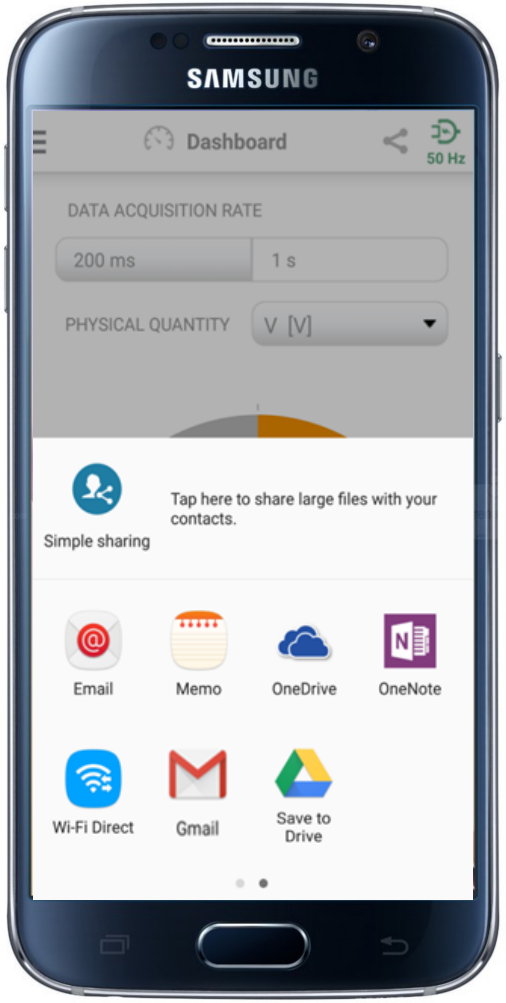
App function: Export data

If the exported data are ready, you can start the export via the message area of your mobile phone.

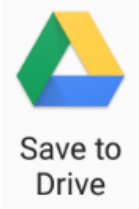


Here you can see the various destinations your device offers.

App function:
Data export: recommendations

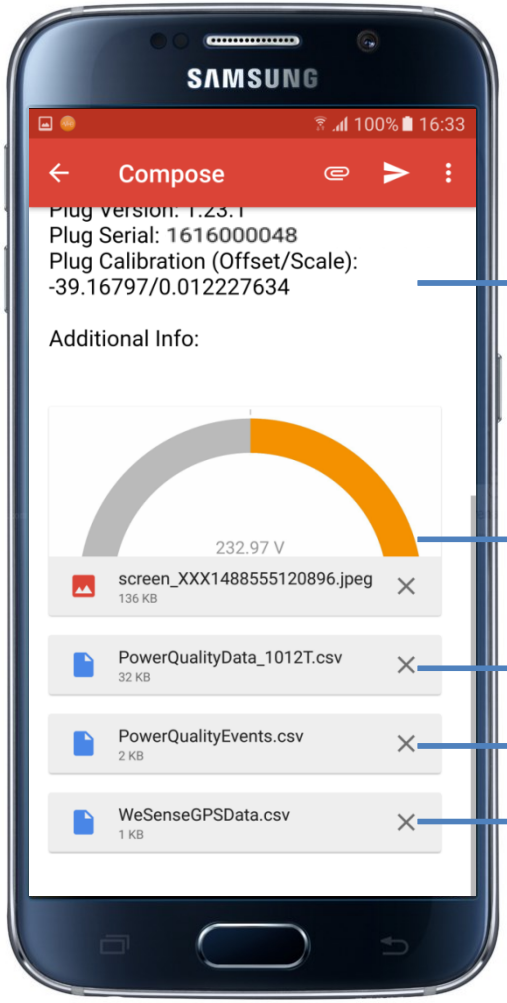


Email / Gmail for smaller amounts of data (approx. 10 MB):
e.g. 200 ms export of up to 2 hours,
e.g. 1 s export of up to 24 hours



Online data storage such as Google Drive for larger amounts of data (approx. 10-15 MB):
e.g. 1 s export of 24 to 36 hours

App function
Data export: What is being exported?



By exporting to GMAIL, you can see which data objects are exported:

- Body of email with diagnostic information about your measurement system: app version, charger ID, etc.
- A screenshot of the screen from which the export was effected, at the time it was effected
- Measurement data series, complete
- Power Quality event list
- GPS location information about your device (if location function has been activated on your system)

File Format – Permanent measurement records PowerQualityData_nnT.csv

Note: The file name is derived from the exported measurement data class.

Data Class	Filename
10T / 12T	PowerQualityData_1012T.csv
50T / 60T	PowerQualityData_5060T.csv

Note: The internal data format of the CSV file is set determined by the language setting of the exporting Android device.

Android OS,
Language = EN

```
1 PQ_ID,Timestamp,Frequency5060T(Hz),Vol
2 164875,2017-01-17 20:47:07.384,50.005,
3 164880,2017-01-17 20:47:08.384,50.006,
4 164885,2017-01-17 20:47:09.385,50.007,
5 164890,2017-01-17 20:47:10.385,50.008,
6 164895,2017-01-17 20:47:11.386,50.007,
```

Column separator: ,
Decimal separator: .

Android OS,
Language = DE

```
1 PQ_ID;Timestamp;Frequency5060T(Hz);Volt
2 1002960;2017-01-15 20:58:05,572;50,039;
3 1002965;2017-01-15 20:58:06,569;50,037;
4 1002970;2017-01-15 20:58:07,568;50,036;
5 1002975;2017-01-15 20:58:08,569;50,035;
6 1002980;2017-01-15 20:58:09,568;50,034;
```

Column separator: ;
Decimal separator: ,

Data import into Microsoft Excel

Open `PowerQualityData_nnT.csv` in Microsoft Excel (e.g. double click in Windows Explorer)

Date and Time (millisecond accuracy)

Grd frequency (Hz)

Grid voltage (V)

Amplitudes Hx (% rel. V_nom)

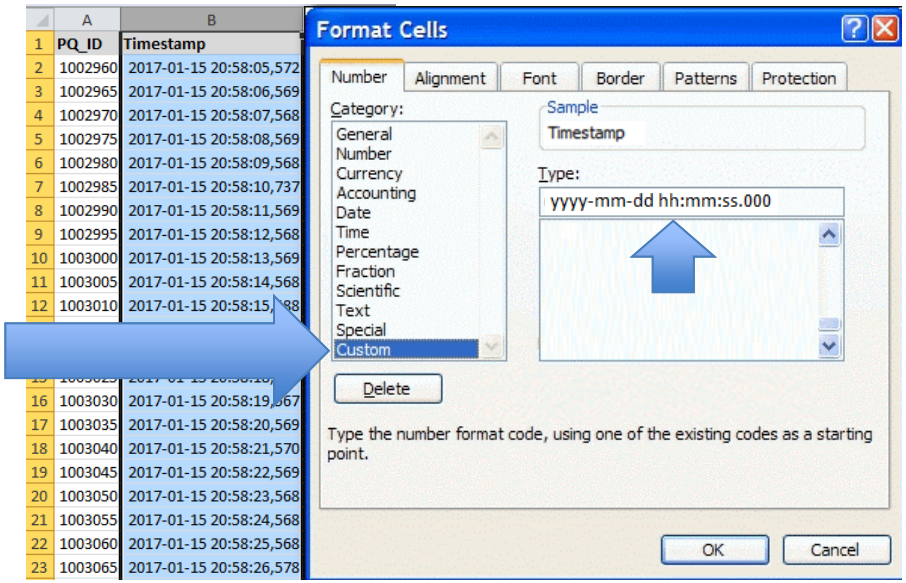
	A	B	C	D	E	F	G	H	I	J	K
1	PQ_ID	Timestamp	Frequency5060T(Hz)	VoltageEff_5060T(V)	H3_5060T(Hz)	H5_5060T(Hz)	H7_5060T(Hz)	H9_5060T(Hz)	H11_5060T(Hz)	H13_5060T(Hz)	H15_5060T(Hz)
2	1002960	2017-01-15 20:58:05,572	50,039	236,69	0,4	1,92	0,84	0,27	0,25	0,24	0,29
3	1002965	2017-01-15 20:58:06,569	50,037	236,71	0,4	1,91	0,85	0,26	0,26	0,24	0,28
4	1002970	2017-01-15 20:58:07,568	50,036	236,69	0,38	1,91	0,85	0,26	0,25	0,25	0,28
5	1002975	2017-01-15 20:58:08,569	50,035	236,74	0,39	1,91	0,84	0,26	0,26	0,25	0,29

	L	M	N
1	RelativeVoltage_5060T(%)	NumberOfPqEvents	TimeStamp5060T(ms)
2	102	0	1,48451E+12
3	102	0	1,48451E+12
4	102	0	1,48451E+12
5	102	0	1,48451E+12

Normalized grid voltage (% rel. V_nom)

Number of PQ events so far

	A	B
1	PQ_ID	Timestamp
2	1002960	2017-01-15 20:58:05,572
3	1002965	2017-01-15 20:58:06,569
4	1002970	2017-01-15 20:58:07,568
5	1002975	2017-01-15 20:58:08,569
6	1002980	2017-01-15 20:58:09,568
7	1002985	2017-01-15 20:58:10,737
8	1002990	2017-01-15 20:58:11,569
9	1002995	2017-01-15 20:58:12,568
10	1003000	2017-01-15 20:58:13,569
11	1003005	2017-01-15 20:58:14,568
12	1003010	2017-01-15 20:58:15,568
16	1003030	2017-01-15 20:58:19,567
17	1003035	2017-01-15 20:58:20,569
18	1003040	2017-01-15 20:58:21,570
19	1003045	2017-01-15 20:58:22,569
20	1003050	2017-01-15 20:58:23,568
21	1003055	2017-01-15 20:58:24,568
22	1003060	2017-01-15 20:58:25,568
23	1003065	2017-01-15 20:58:26,578

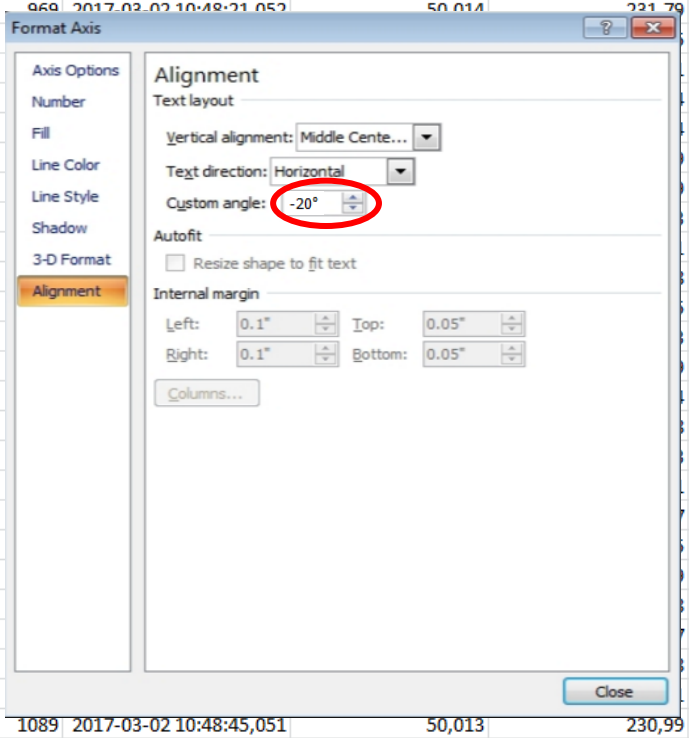


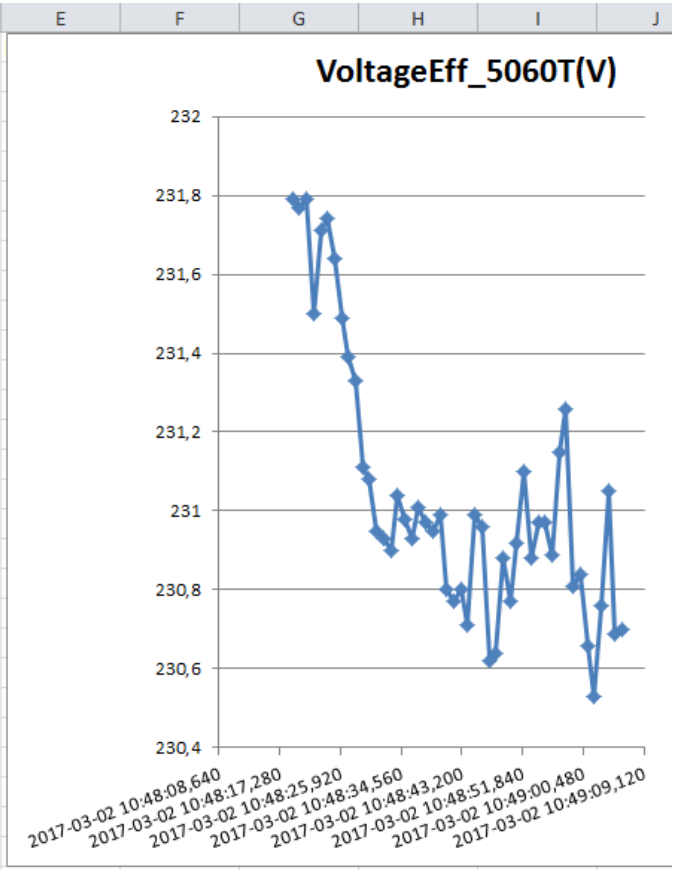
In order to use millisecond-accuracy timestamps in Microsoft Excel, adapt this custom date/time format in the corresponding column properties.

Plot Data in Microsoft Excel

Custom Date/time stamp was set correctly! This can be seen from the automatic alignment on the right-hand side.

	A	B	C	D
1	PQ_ID	Timestamp	Frequency5060T(Hz)	VoltageEff_5060T(V)
2	959	2017-03-02 10:48:19,052	50,015	231,79
3	964	2017-03-02 10:48:20,064	50,014	231,77
28	1089	2017-03-02 10:48:45,051	50,013	230,99





Ideally Time series are plotted as (x,y) Scatter- or Line-diagrams.

To do this, first highlight the timestamp column („x“) as well as another column („y“).

Hint: Double click on x-axis, then adjust the font orientation for improved readability („custom angle dialog“).

Data format – WeSensePowerQualityEvents.csv

Column format (CSV data after import into a spreadsheet editor):

PQ event type (name)

Event duration (ms)

Amplitude of voltage event (V)

Harmonic order (only harmonics events)

Percentage of Hx samples above threshold

Timestamp of event detection

	EventID(X)	MessageID(Y)	PQEventTypeName(Y)	StartTime(Y)	EventLength(Y)	MinMax(Y)	HarmonicNumberTarg(Y)	FailPercentage(Y)	tsinsert(Y)
Long Name	Event_ID	Message_ID	PQEventTypeName	StartTime	EventLength	MinMax	HarmonicNumberTarget	FailPercentage	ts_insert
Units	Event_ID	Message_ID	PQEventTypeName	StartTime	EventLength	MinMax	HarmonicNumberTarget	FailPercentage	ts_insert
Comments									
Sparklines									
1	1	0	PQ_EVENT_TYPE_PLUG_CONNECTED	1,46824E12	0	0	0	0	29 Juni 2016 10:50:50.920
2	2	56	PQ_EVENT_TYPE_INTERRUPT	1,46824E12	19	9,57	0	0	29 Juni 2016 11:05:50.920
3	3	57	PQ_EVENT_TYPE_SWELL	1,46824E12	2008	260,09	0	0	29 Juni 2016 11:05:57.154
4	4	58	PQ_EVENT_TYPE_DIP	1,46824E12	2003	148,25	0	0	29 Juni 2016 11:06:03.371
5	5	0	PQ_EVENT_TYPE_PLUG_DISCONNECTED	1,46824E12	0	0	0	0	29 Juni 2016 11:11:03.371
6	6	114	PQ_EVENT_TYPE_HARMONIC	1,46824E12	1,21365E6	0	15	5	29 Juni 2016 11:11:05.571
7	7	115	PQ_EVENT_TYPE_HARMONIC	1,46824E12	1,21365E6	0	15	5	29 Juni 2016 11:11:05.571

Voltage Events Dip/Swell/Interrupt: Duration (ms); Max. Min Ampl. (V)

Event timestamp.

Harmonics Events: Measurement period (between plugging and unplugging adapter);

Harmonics order of Hx event

Total percentage of all 1s RMS Hx-svalues above threshold during measurement period

Time of Event Assessment (i.e. end of the measurement period)

Data format – WeSenseGPSData.csv

Column format (CSV data after import into a spreadsheet editor):

Timestamp

Longitude

Latitude

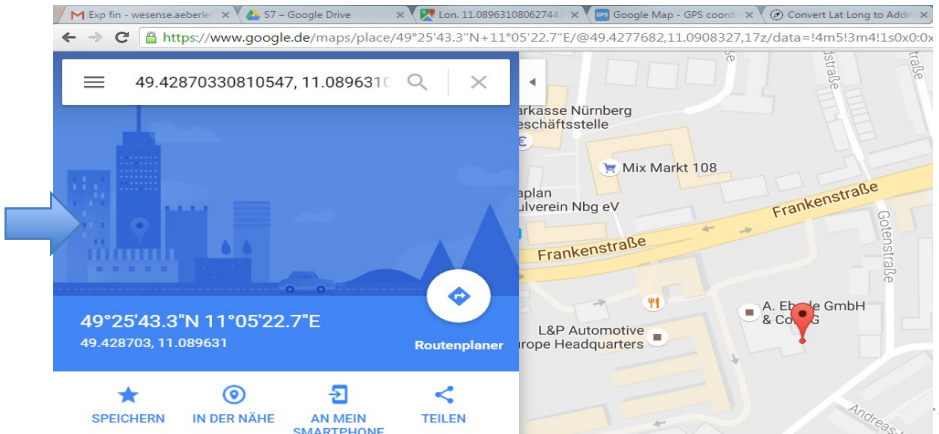
	GPSID(X)	GpsTime(Y)	Provider(Y)	Altitude(Y)	Longitute(Y)	Latitute(Y)	Accuracy(Y)	Speed(Y)	Bearing(Y)	J(Y)
Long Name	GPS_ID	GpsTime	Provider	Altitude	Longitute	Latitute	Accuracy	Speed	Bearing	
Units	GPS_ID	GpsTime	Provider	Altitude	Longitute	Latitute	Accuracy	Speed	Bearing	
Comments										
Sparklines										
1	1	10.06.2016 15:29:54	network	0	11,0896310806274	49,4287033081055	23,283	0	0	
2	2	10.06.2016 15:32:15	network	0	11,0896053314209	49,4286880493164	59,204	0	0	
3	3	10.06.2016 15:32:15	network	0	11,0896053314209	49,4286880493164	59,204	0	0	

```
1 GPS_ID;GpsTime;Provider;Altitude;Longitute;Latitute;Accuracy;Speed;Bearing
2 1;10.06.2016 15:29:54;network;0.0;11.089631080627441;49.42870330810547;23.283;0.0;0.0;
3 2;10.06.2016 15:32:15;network;0.0;11.089605331420898;49.428688049316406;59.204;0.0;0.0;
4 3;10.06.2016 15:32:15;network;0.0;11.089605331420898;49.428688049316406;59.204;0.0;0.0;
```

Hint: Entering …

`LAT, LON`

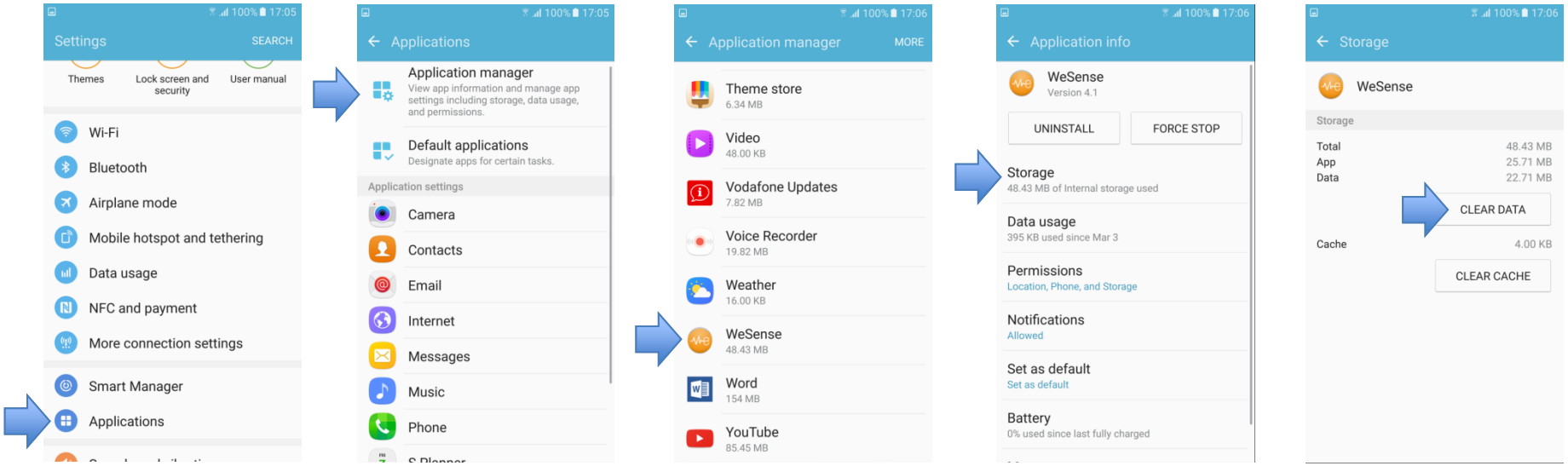
… inside Google Maps shows the location directly!



Help with app issues...

1. The app suddenly stops working even though the adapter has been properly connected / reconnected.

Sporadic problems may arise with the WeSense™ app's internal memory structure. In this case, manually delete the entire app data by using the Android application manager. To do so, follow these steps:



Help with app issues...

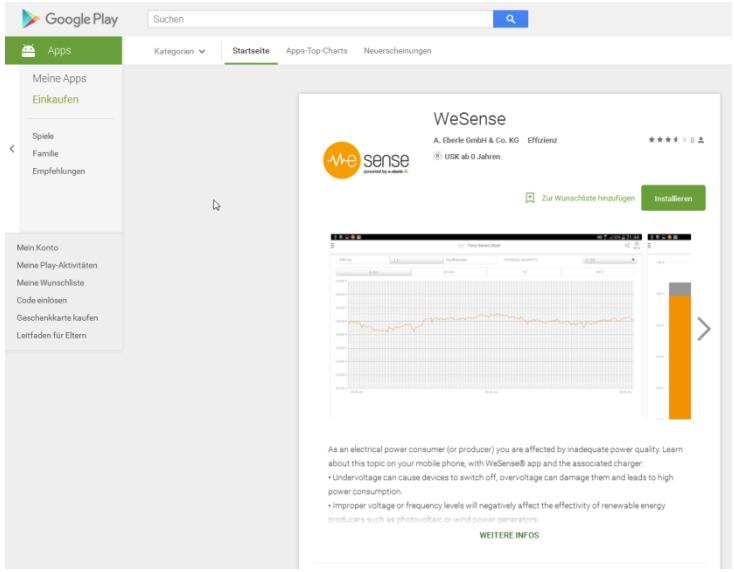
2. Measurement runs upon opening one of the live display screens, but the measurement data display does not start as it should, or old data is displayed.
Sporadically, the screen is not updated even though the background service for data processing is running (you will see the orange WeSense™ icon in the quick access bar). This issue can be solved by simply calling up this screen again – the display is thus updated. Alternatively close the WeSense™ app using Android program manager, then open it again

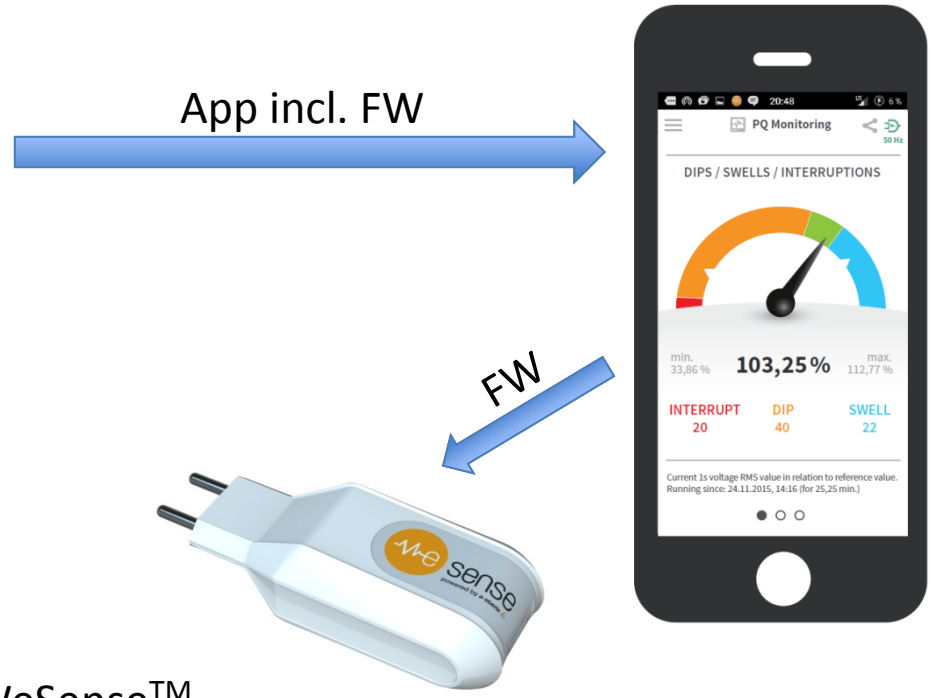
Your problem has not been solved?

Send an email to wesense@a-eberle.de and describe the problem to our support team.

Note: App/FW update

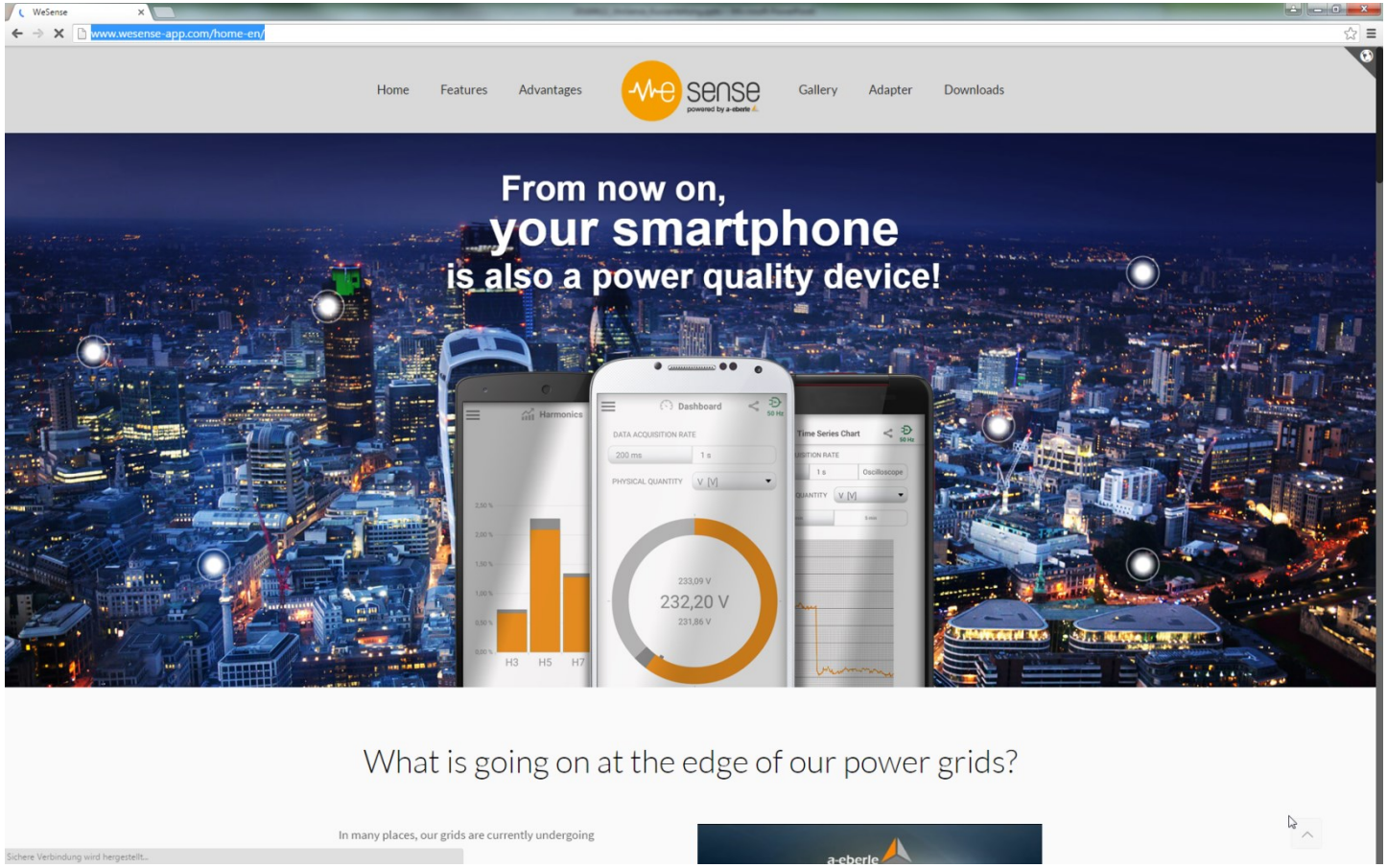
Google Playstore as source





Enable automatic updates for the WeSense™ app on your phone to benefit from stability improvements as well as new app features!

More info, downloads and news available at the homepage www.wesense-app.com



Contact

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