

# User Manual– MARWIS App

App Version 1.15

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# 1 Basic Setup

This first chapter will show how to connect to the Marwis device via Bluetooth and how to configure the Marwis device within the Marwis App.

Before you can start the Marwis App, the Bluetooth connection between the Marwis device and the iPad/iPhone must be established, and some basic settings might have to be adjusted in the app settings.

## 1.1 Bluetooth Pairing

Open "Settings" on your iPad/iPhone and activate Bluetooth.

Power on the MARWIS device.

The device will show as "MARWIS-UMB\_XXXX.YYYY" (where XXXX.YYYY is the serial number of the device) in the Bluetooth device list.

Pair your iPad/iPhone with the device.

### **The PIN for pairing is 1007**

Note: the device will store the pairing information and automatically reconnect to the iPad/iPhone if the connection was lost and the device is in reach again.

## 1.2 Marwis App - Settings

In the iOS settings some basic parameters for the Marwis app can be set:

Parameter	Default Value	Description
Server Connection Enabled	OFF	Connection to SmartView server enabled/disabled
Server Name/IP Address		The host name or IP address for the SmartView server
TCP Port	30100	The TCP port for the server connection
Communication Timeout	30	Communication timeout in seconds for the server connection
Transmission Interval	10	Interval in seconds in which the data is queued to be sent to the server
Location Change Standby Timeout	10	Standby timeout in minutes for location change. Data transfer to the server is suspended if the

		location does not change for the configured time period.
Device Communication Standby Timeout	5	Standby timeout in minutes for device communication. Data transfer to the server is suspended if there is no Bluetooth connection to the device for the configured amount of time.
Device Connection Enabled	ON	Connection to the Marwis device enabled/disabled.
Communication Timeout (ms)	750	The communication timeout with the MARWIS device in milliseconds
Retries on error	3	The number of retries for the device communication
Marwis UMB address	40961	The default UMB address for the MARWIS device – used when adding sensor channels to the configuration
Use Imperial Units	Off	Determines which UMB sensor channels are set up for polling when the “default sensor channels” for MARWIS are added to the sensor channel configuration
Simple Road Condition Status (Green/Yellow/Red)	Off	If switched to “On”, the road condition status shown on the map is simplified to green = ok (dry/damp/wet), Yellow = warning, Red = critical road condition status
Fade Out Interval	1200	The interval in seconds to fade out the road condition trail on the map
Remove Interval	1200	The interval after which data is not shown on the road condition trail anymore
Display Overlay coordinates as GCJ-02 (for China)	Off	If “On”, the coordinates for displaying the location and track on the map within the app is calculated to “GCJ-02” coordinates (the coordinate system used in China).
Check for Firmware Updates	ON	Automatically check for firmware updates
Firmware Update URL	<a href="http://firmware.lufft-marwis.com/MARWISFirmwareUpdateInfo.xml">http://firmware.lufft-marwis.com/MARWISFirmwareUpdateInfo.xml</a>	Configuration file for Marwis firmware updates

Enable Cam	Off	Enable transmission of cam pictures
Auto Capture Picture	Off	Automatically capture a picture every xx seconds. Note: pictures will only be transferred if the location is different from the last picture taken
Auto Capture Interval	60	Interval in seconds to automatically capture a picture

Usually the default settings are sufficient. If you prefer to use imperial units (°F/mil) over metric units (°C/μm) you might want to set the "Use Imperial Units" to "ON" before continuing your setup.

If a SmartView server is used to process/display the data you need to enter the server host name or ip address and switch "Server Connection Enabled" to "ON".

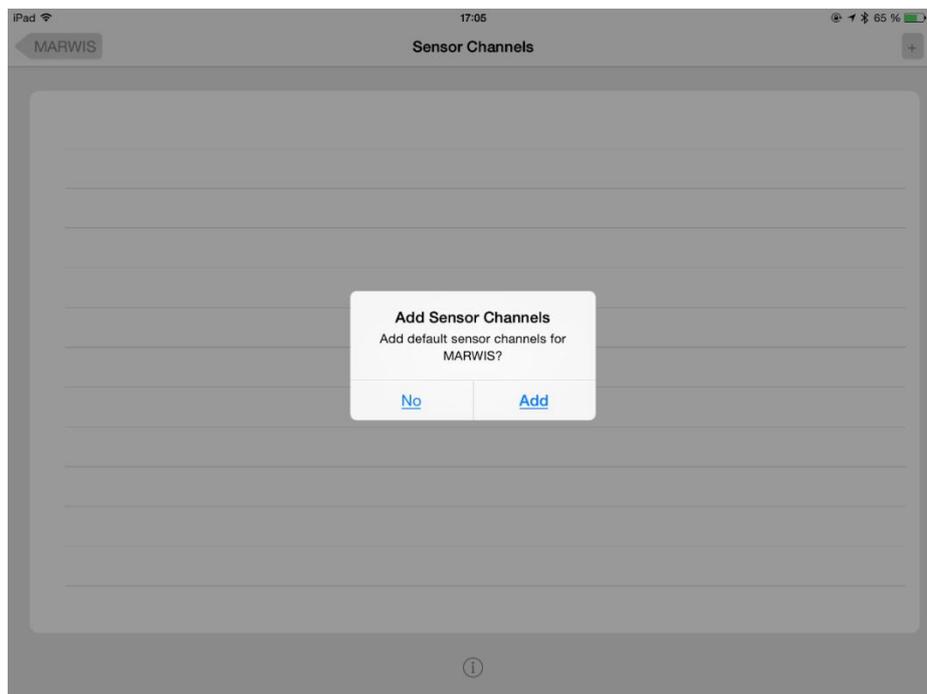
### 1.3 Sensor Channel setup

Start the „Marwis“ App.

If started for the first time, the user is prompted to allow the current location. Please confirm with OK.

As no sensor channels are yet configured, the appropriate dialog is displayed and the user is prompted if the default sensor channels for MARIWS should be added.

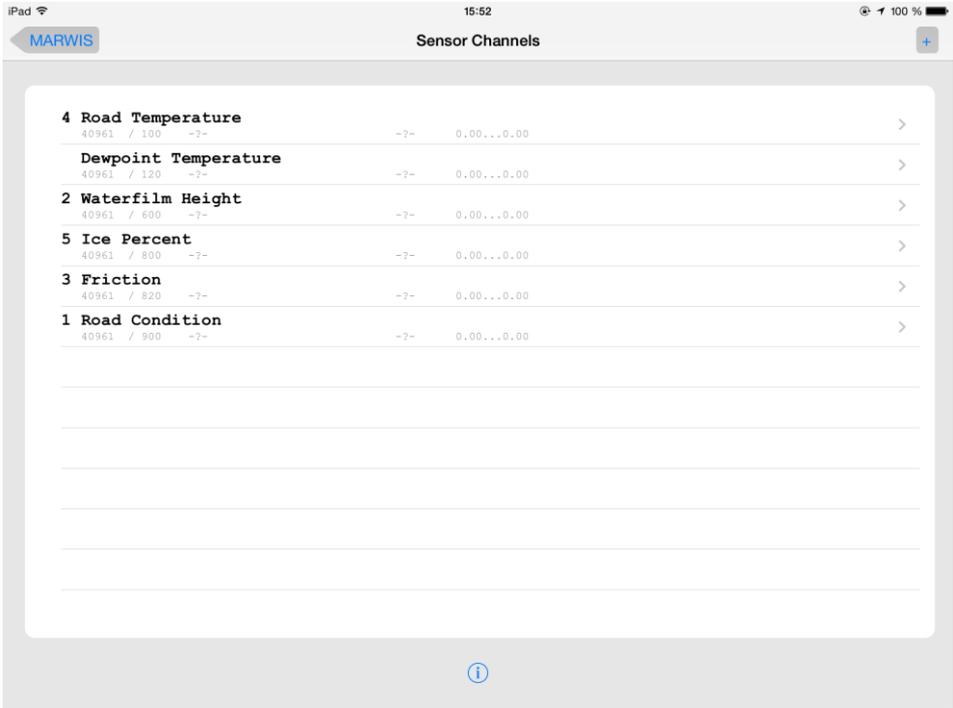
Tap "Add" to confirm adding the default sensor channels.



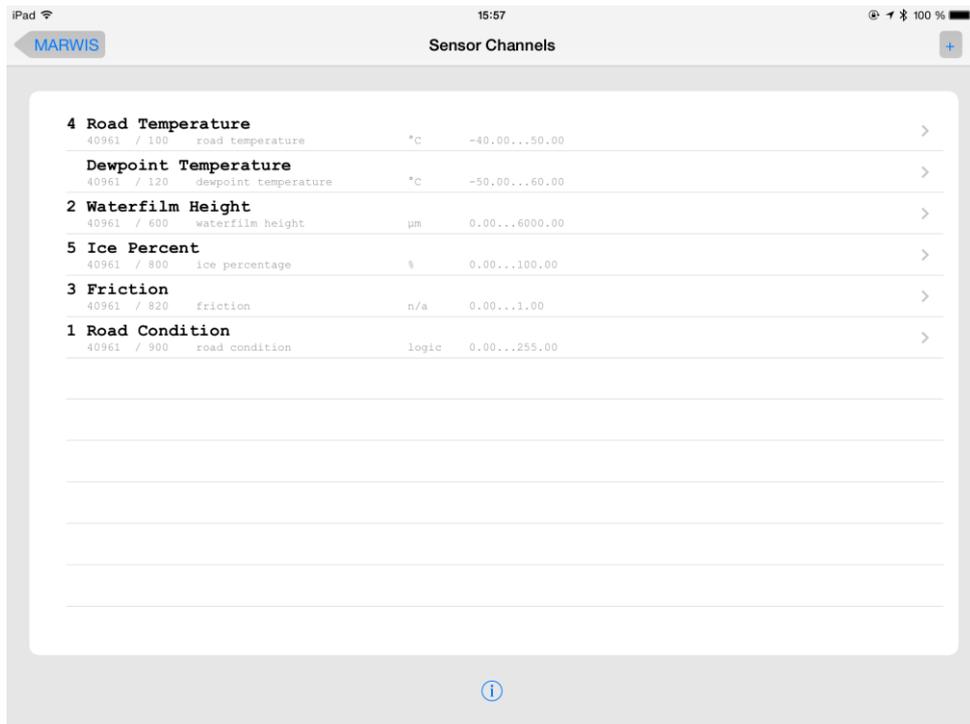
This will add all the default sensor channels for the MARWIS device, with the default Device ID as configured in the Marwis app settings (see above).

If the sensor channels have just been added, the detailed information about the sensor channels is not available yet, indicated by the -?- in the sensor channel list.

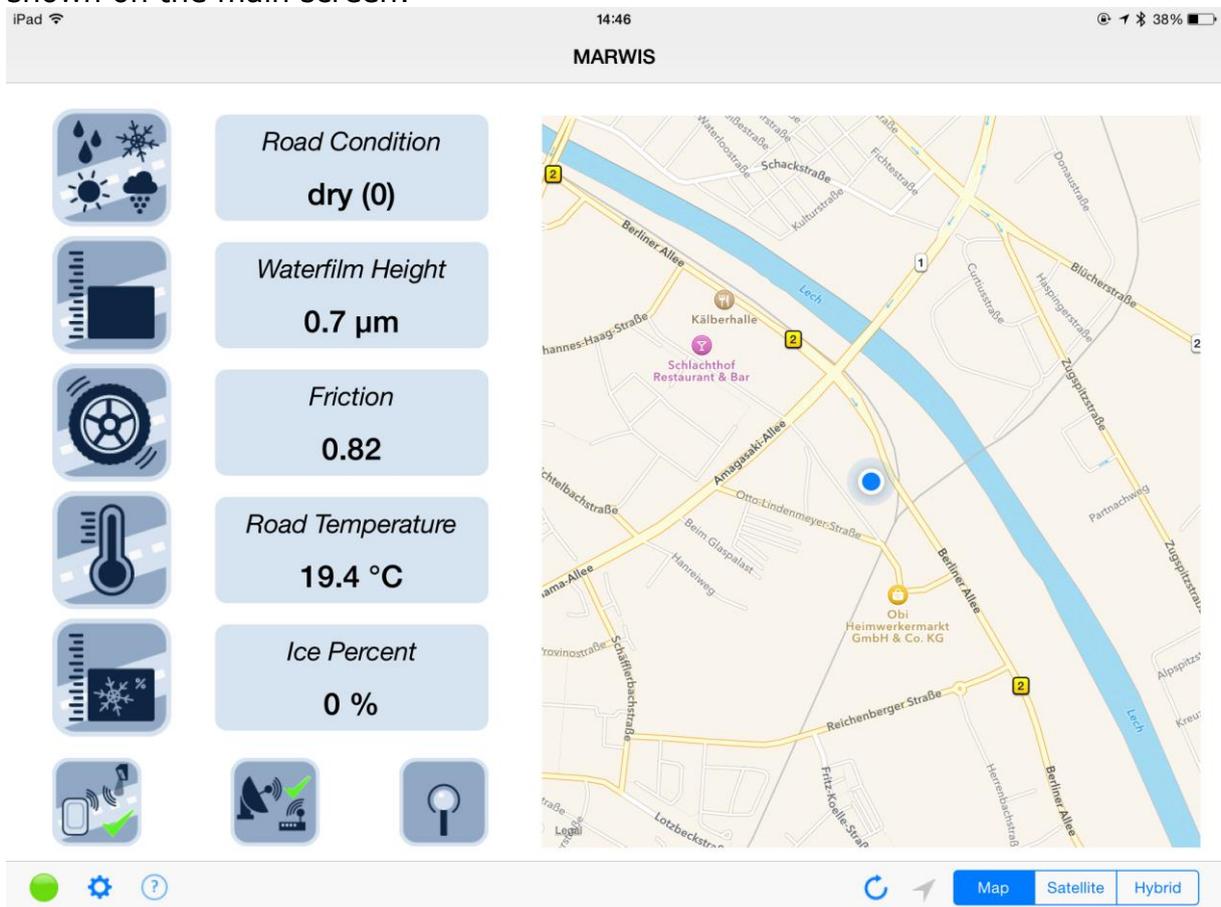
Information about each sensor channel is read from the Marwis device after the device is connected the first time.



If the communication with the device is established and the sensor and device configuration could be retrieved, information about the sensor channels, i.e. the device internal name/description and unit for each channel, and the value range for each channel, is updated.



Measure values will be acquired for all (active) sensor channels, and will be shown on the main screen:



The "Sensor Channels" display will now show the last sensor value for each channel (if available) or error information (if no value could be retrieved from the device).

Channel ID	Channel Name	Unit	Value
40961 / 100	Road Temperature	°C	26.2
40961 / 120	Dewpoint Temperature	°C	23.70
40961 / 600	Waterfilm Height	μm	320.0
40961 / 800	Ice Percent	%	62
40961 / 820	Friction	n/a	0.69
40961 / 900	Road Condition	logic	damp (1)

## 2 Detailed description

### 2.1 Marwis App Settings

#### 2.1.1 Server Connection

The Marwis app primary function is not only to display the measurement data on the iPad/iPhone display, but to transmit this data to a SmartView server for further processing.

The connection to SmartView is configured through the iOS settings / Marwis settings (see chapter 1.1 as well) and the following parameters:

Parameter	Default Value	Description
Server Connection Enabled	OFF	Connection to SmartView server enabled/disabled
Server Name/IP Address		The host name or IP address for the SmartView server
Port	30100	The TCP port for the server connection
Communication Timeout	30	Communication timeout in seconds for the server connection
Transmission Interval	10	Interval in seconds in which the data is queued to be sent to the server
Location Change Standby Timeout	10	Standby timeout in minutes for location change. Data transfer to the server is suspended the location does not change for the configured time period.
Device Communication Standby Timeout	5	Standby timeout in minutes for device communication. Data transfer to the server is suspended if there is no Bluetooth connection to the device for the configured amount of time.

The Marwis app will use the (first) device serial number as an ID for SmartView.

In order to connect to the SmartView server, the server must be running, and the Marwis interface must be configured as "active" for SmartView/Collector. Note that the TCP port might have to be forwarded/enabled in your router and/or firewall.

The server dns host name or ip address must be configured, the "server connection enabled" switch must be set to "ON".

If the SmartView server uses a different TCP port, the appropriate port number must be configured for the Marwis app.

The data collected by the Marwis app will be forwarded to the server in the configured "Communication Interval".

The "Transmission Interval" controls the interval in which measure values are collected to be forwarded to the server.

If the server connection is interrupted, the data retrieved from the Marwis device is stored/queued within the app and transmitted to the server as soon as the connection could be re-established.

"Location Change Standby Timeout": if the GPS coordinates for the iPad/iPhone did not change for the specified amount of time (in minutes), data transmission to the server is suspended until the GPS coordinates change again (i.e. the position of the vehicle changes).

"Device Communication Standby Timeout": if the Bluetooth connection to the device is interrupted for the specified amount of time (in minutes), data transmission to the server is suspended until the Bluetooth connection is re-established.

### 2.1.2 Device Connection

The following parameters control the (Bluetooth) communication with the Marwis device:

Parameter	Default Value	Description
Device Connection Enabled	ON	Connection to the Marwis device enabled/disabled.
Communication Timeout (ms)	750	The communication timeout with the MARWIS device in milliseconds
Retries on error	3	The number of retries for the device communication
Marwis UMB address	40961	The default UMB address for the MARWIS device – used when adding sensor channels to the configuration
Use Imperial Units	Off	Determines which UMB sensor channels are set up for polling when the "default sensor channels" for MARWIS are added to the sensor channel configuration

Device Connection Enabled/Disabled: mainly for testing purposes – the device connection should always be enabled.

Communication Timeout: the timeout for the device communication.

Retries on error: the number of times an UMB command will be retried before it is considered a timeout.

Marwis UMB address: the default UMB address for the Marwis device – used when sensor channels are added to the configuration.

Use Imperial Units: controls whether the sensor channels for metric ( $^{\circ}\text{C}/\mu\text{m}$ ) or imperial ( $^{\circ}\text{F}/\text{mil}$ ) units are added to the sensor channel configuration when the default sensor channels for a Marwis device are configured.

### 2.1.3 Data Display

The following parameters control how the data is displayed on the main “dashboard” screen of the app

Parameter	Default Value	Description
Simple Road Condition Status (Green/Yellow/Red)	Off	If switched to “On”, the road condition status shown on the map is simplified to green = ok (dry/damp/wet), Yellow = warning, Red = critical road condition status
Fade Out Interval	1200	The interval in seconds to fade out the road condition trail on the map
Remove Interval	1200	The interval after which data is not shown on the road condition trail anymore
Display Overlay coordinates as GCJ-02 (for China)	Off	If “On”, the coordinates for displaying the location and track on the map within the app is calculated to “GCJ-02” coordinates (the coordinate system used in China).

### 2.1.4 Firmware update

The following parameters control the automatic firmware update for the Marwis device:

Parameter	Default Value	Description
Check for Firmware Updates	ON	Automatically check for firmware updates
Firmware Update URL	<a href="http://firmware.lufft-marwis.com/MARWISFirmwareUpdateInfo.xml">http://firmware.lufft-marwis.com/MARWISFirmwareUpdateInfo.xml</a>	Configuration file for Marwis firmware updates

If enabled, the Marwis app will check for new device firmware every time the app is started, or once every 6 hours when a server connection is established. The user will be notified if a newer firmware version was found and downloaded from the server.

The device firmware is stored on the iPad/iPhone. Every time a connection to a Marwis device is established, the device firmware version is checked against the stored firmware. If the stored firmware is newer, the user is prompted whether the device firmware should be updated or not.

If confirmed, the firmware on the Marwis device is updated via Bluetooth.

### 2.1.5 Camera Picture Support

Enable Cam	Off	Enable transmission of cam pictures
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Auto Capture Picture	Off	Automatically capture a picture every xx seconds. Note: pictures will only be transferred if the location is different from the last picture taken
Auto Capture Interval	60	Interval in seconds to automatically capture a picture

Here, transmission of camera pictures taken from the iPhone/iPad camera can be activated.

If camera transfer has been enabled, a camera icon  will be shown on the dashboard display next to the help (  ) icon.

Tapping this camera icon will grab a picture and transmit it to the server.

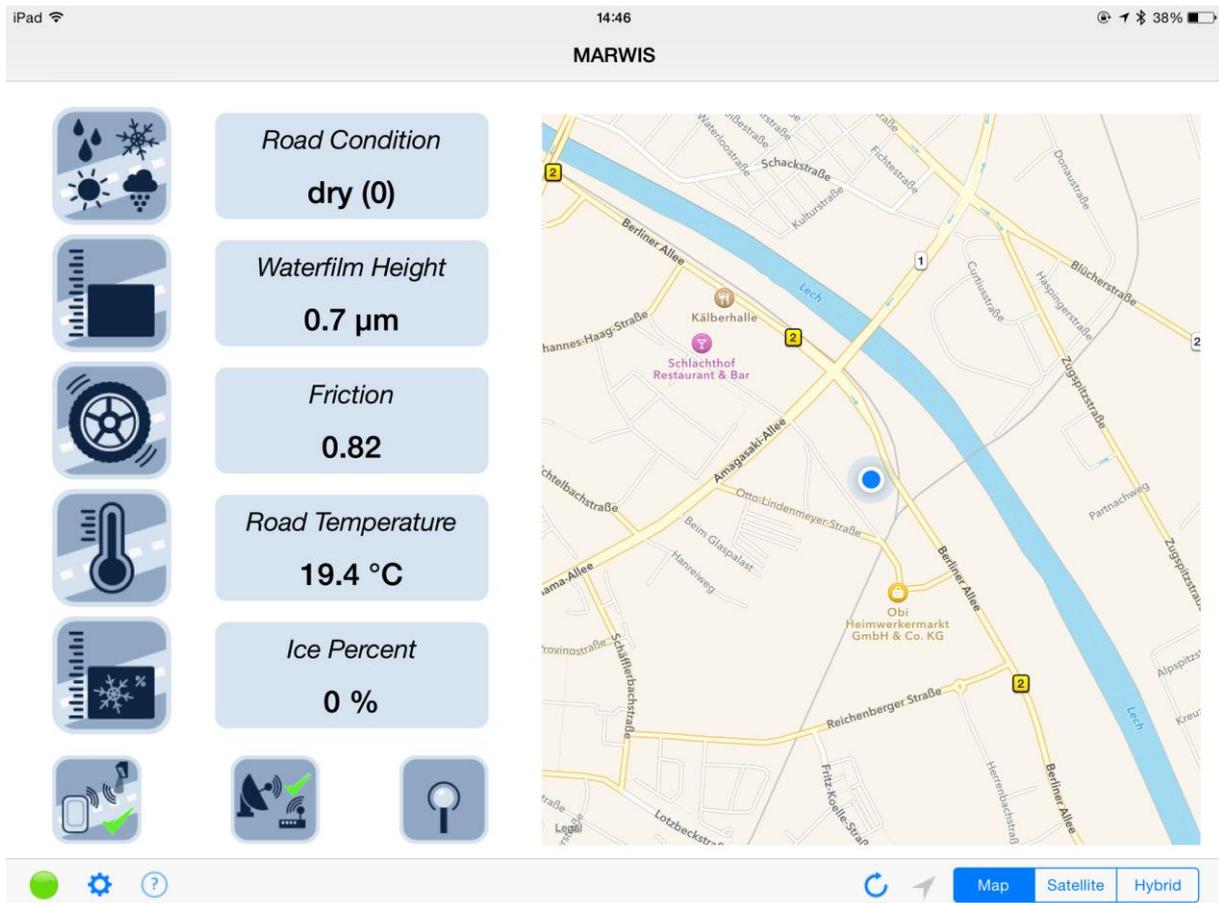
If "Auto Capture Picture" is enabled, a picture will be taken in the configured capture interval. Note that the (automatically captured) picture will only be transferred to the server, if the location of the picture is different from the last picture.

If a picture is taken and transferred to the server (or, better, queued for transfer to the server), a small version of the picture is shown on the dashboard display (lower middle area).

If a picture is taken, but not transferred to the server, the picture is NOT shown – instead only the frame around the picture is visible – to indicate that the picture was not automatically transferred because the location did not change.

## 2.2 Dashboard Display

The main display of the app is the "dashboard display". It shows the last retrieved sensor values (for up to 5 sensor channels) and a map with a trail indicating the road condition value.



### 2.2.1 Measurement Values

On the left hand side the current measurement values for the configured sensor channels (see below) are displayed.

A symbol on the left side indicates the type of measurement value. Tapping on a symbol will display a short description for the measurement type.

### 2.2.2 Status Icons

Below the measurement values 3 icons indicate the status of the

- a) Bluetooth connection
- b) Server connection
- c) GPS Signal quality

The Bluetooth and server connection status is indicated with a red cross (no connection) or a green arrow (connected). The GPS signal quality is indicated by the number of curves around the antenna symbol (the more curves the better the signal quality).

Tapping on one of these icons will show a short description.

Below the Bluetooth status icon are 3 small symbols located:

- Status LED: The status LED indicates the status of the MARWIS device.  
Gray = no connection  
Blue = Bluetooth connection is established and configuration data is being read from the device

Green = normal operation

Yellow = device is operational but adjustment might be needed (see below)

red = there is a problem with the device.

purple = firmware update in progress

- small gear symbol – tapping this leads to the configuration display for the sensor channels (see below)
- small circle with a question mark – display online help for the app (requires internet connection).

### 2.2.3 Map Display

On the right hand side of the display the map with a color trail of the route taken is shown.

The map can be moved/zoomed with the usual pinching and swiping gestures.

The color mapping for the trail on the map depends on the app setting "Simple Road Condition Status (Green/Yellow/Red)"

If this is active, the mapping is as follows:

Numerical value	Meaning	Color
0	Dry	Green
1	Damp	Green
2	Wet	Green
3	Ice	Red
4	Snow/Ice	Red
5	Chemically wet	Green
6	Freezing	Yellow
7	Critical	Yellow
8	Snow	Red
> 8	Unknown	Light-Gray

If this is not active, the color assignment is as follows:

Numerical value	Meaning	Color
0	Dry	Light gray
1	Damp	Light blue
2	Wet	Dark blue
3	Ice	Rosy
4	Snow/Ice	Red
5	Chemically wet	Dark Gray
6	Freezing	Yellow
7	Critical	Rosy
8	Snow	Red
> 8	Unknown	Light Gray

The trail will “fade out” (i.e. the color will become more opaque) over the configured “Fade Out Interval”, and the data will be removed from the tail after the configured “Remove Interval”.

Below the map are 2 icons and a segment control to select the map type.

The left of these icons – the curve – clears the path trail from the display.

The small arrow indicates whether the map “follows” the current position (i.e. the map automatically moves with the vehicle so that the current position is always in the center of the map) or not. If the arrow is gray (disabled) the map follows the position (and therefore is disabled). If it is blue, the map is not centered to the current position and tapping on the arrow will re-center the map.

The segment control allows to switch the map display between (road) map, satellite images and hybrid (road map and satellite images).

Note that the satellite images cause higher data transfer from the map server.

## 2.3 Sensor Configuration

Tapping on the small gear icon on the dashboard display will open the “Sensor Channels” screen.

Here sensor channels can be added, removed, or configured in detail.

ID	Name	Unit	Value
40961 / 100	Road Temperature	°C	26.2
40961 / 120	Dewpoint Temperature	°C	23.70
40961 / 600	Waterfilm Height	μm	320.0
40961 / 800	Ice Percent	%	62
40961 / 820	Friction	n/a	0.69
40961 / 900	Road Condition	logic	damp (1)

### 2.3.1 Adding sensor channels

There is a button with a "+" symbol on the upper right corner of the screen.

If no sensor channels have been configured yet, tapping this button will prompt the user if the default sensor channels for a Marwis device should be added.

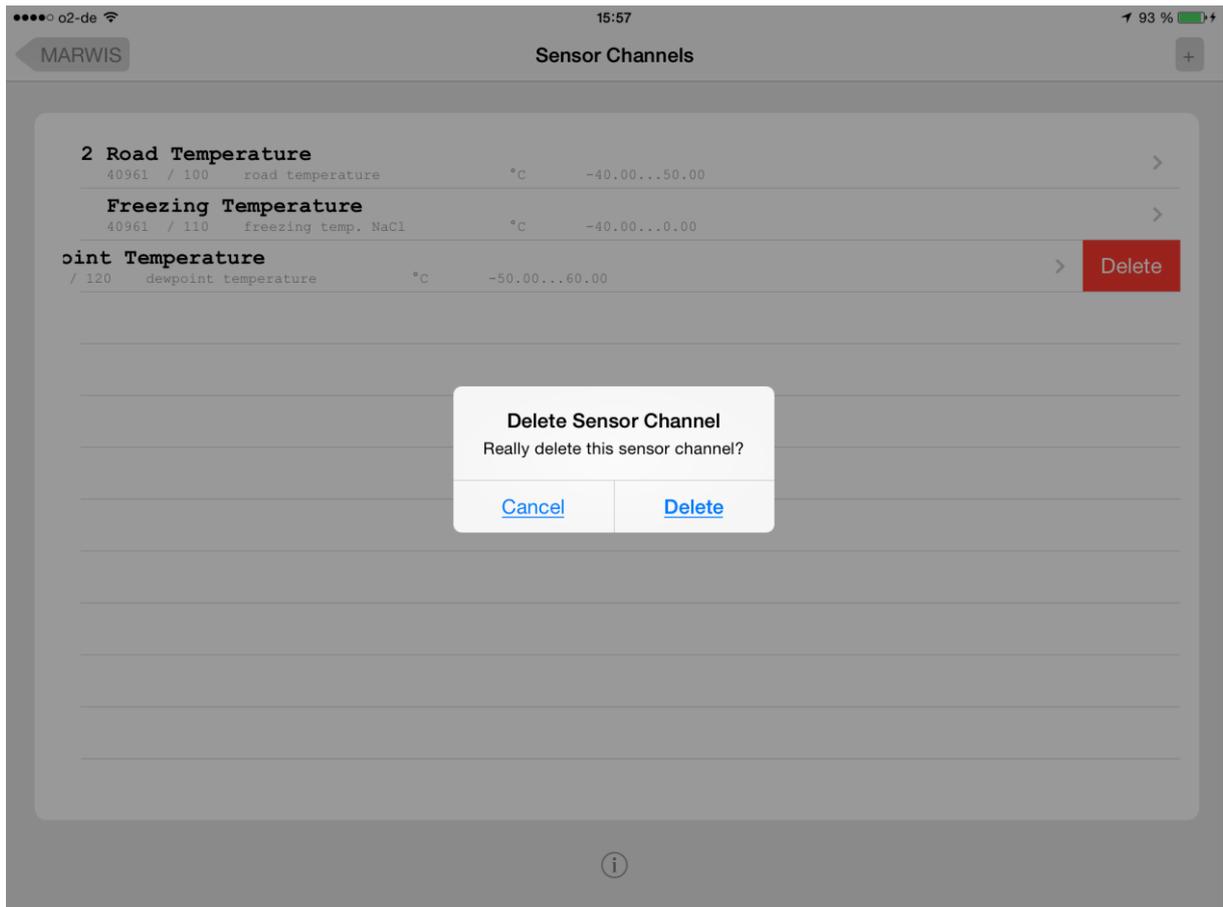
If this is confirmed by the user, following sensor channels are added:

UMB channel nr	Description	Dashboard Display Line
100 (or 105 if "imperial units" are configured)	Road Temperature in °C (or °F)	4
120 (or 125 if "imperial units" are configured)	Dewpoint Temperature in °C (or °F)	-
600 (or 605 if "imperial units" are configured)	Waterfilm height in µm (or mil)	2
800	Ice Percent in %	5
820	Friction	3
900	Road Condition	1

If the user does not confirm adding the default channels, or if there are already sensor channels configured, an inactive "New Sensor Channel" with the default device ID and sensor channel 0 is added to be configured manually.

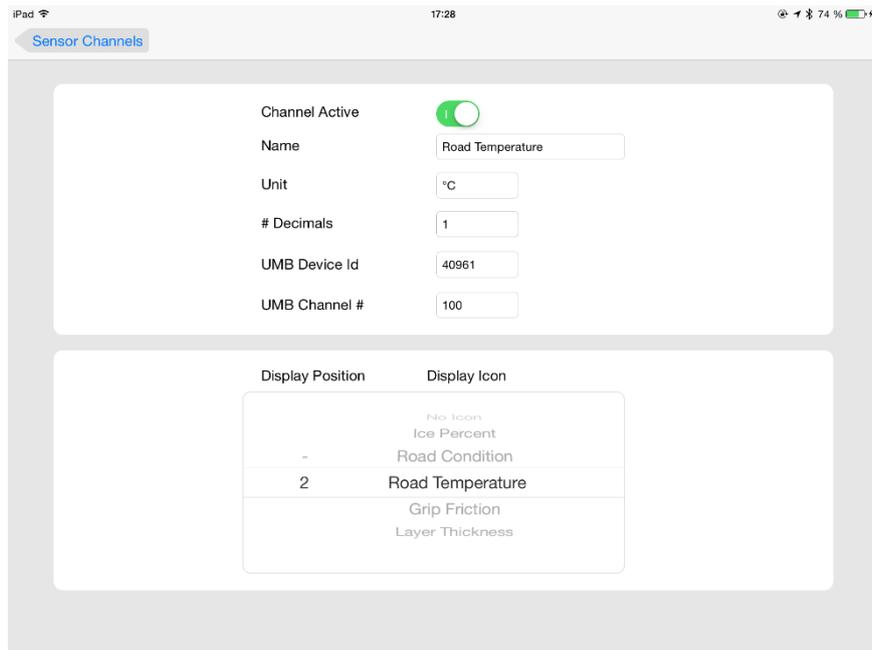
### 2.3.2 Deleting a sensor channel

Swiping on a sensor channel in the list from right to left will show a red "Delete" button on the right hand side. Tapping the button will prompt the user to confirm the removal of the sensor channel from the configuration.



### 2.3.3 Sensor Channel Configuration

Tapping on a sensor channel in the "Sensor Channels" list will show the configuration details for each channel:



The Name, Unit, and #Decimals attributes are used for displaying the sensor information on the main app screen – as is the display position and display icon settings.

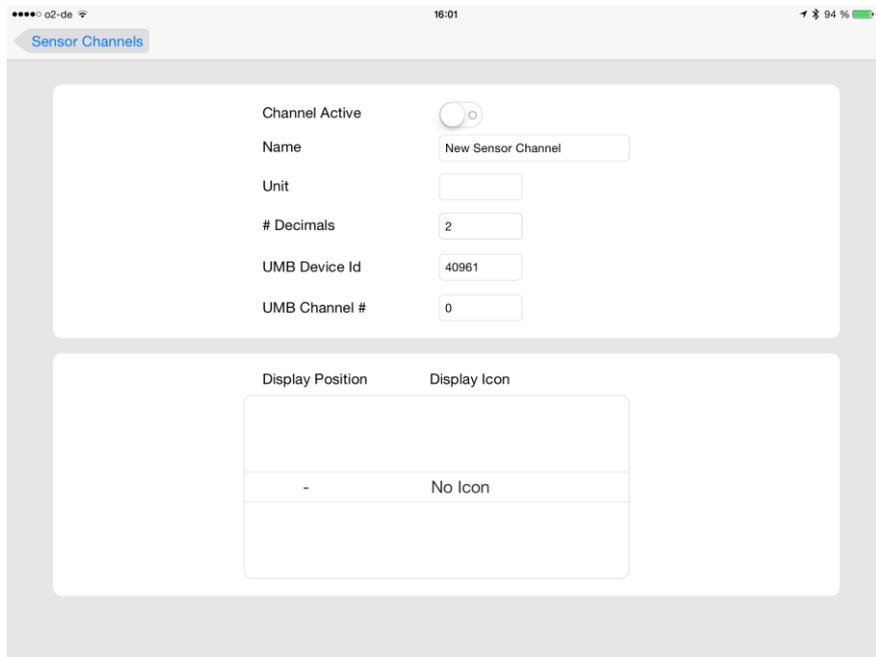
The UMB device id (address) and channel are used for the device communication and for forwarding the data to the SmartView3 server. If needed, other UMB devices or other sensor channels of a MARWIS device can be added to the sensor channels configuration.

Only sensor channels that have a “Display Position” assigned will be displayed on the main app screen.

However, all values for all active sensor channels will be transmitted (if configured) to the SmartView server.

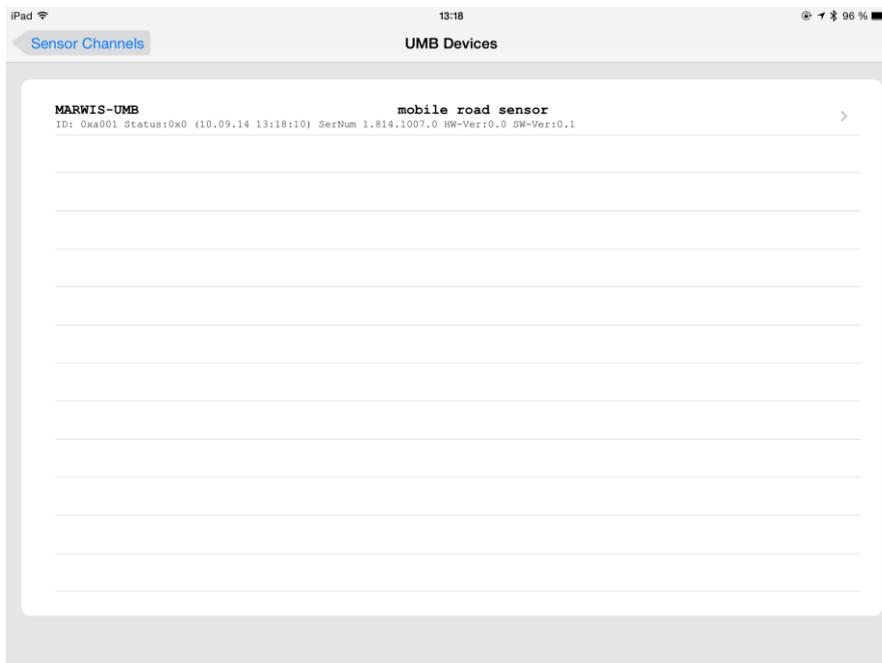
The sensor channel which has been assigned the “Road Condition” icon is used to display the road condition trail on the map display.

Note that only those “Display Positions” can be selected that do not already have a sensor assigned. If a new sensor channel is added to the default sensor channels, all display positions are occupied so that no selection is offered:



## 2.4 Device Information

Tapping on the (i) symbol on the sensor channels display will show detailed information about the connected UMB devices, e.g. device software and hardware version information etc.

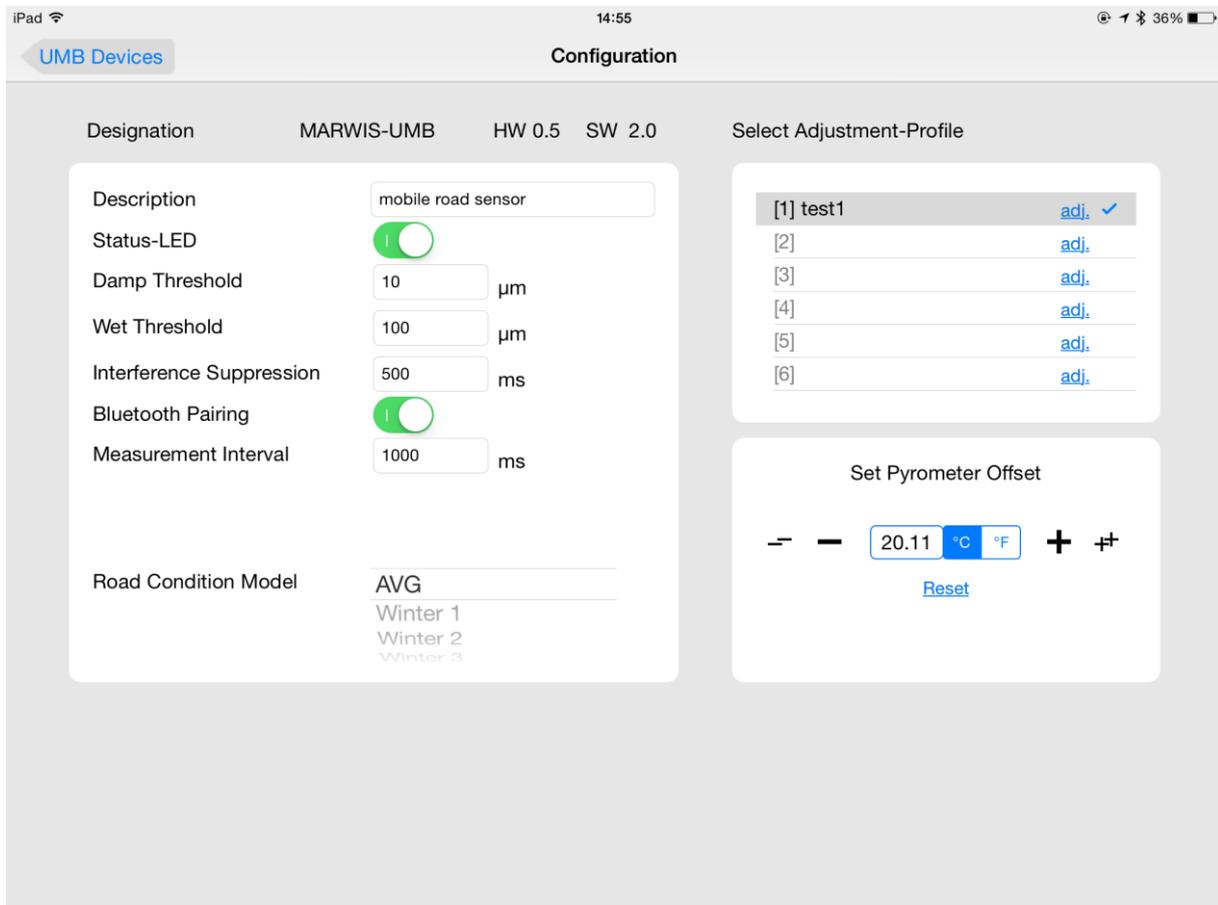


Note: the Marwis app supports any kind of UMB device, and any number of UMB devices connected via bluetooth, so this screen is designed to show more than one device, even though you will usually connect to only one Marwis device.

Tapping on a device in the list opens the "Device Configuration" dialog (if the Bluetooth connection is established):

## 2.5 Device Configuration

Here some device settings can be edited.



Note that any configuration changes will be transmitted to the device when the dialog is closed (by returning to the device information screen). Note that in order for the configuration changes to take effect the device must be reset/restarted.

The following parameters can be set:

- Description: the device description
- Status-LED: enable/disable the status LED (on the front of the Marwis device)
- Damp Threshold: if the water film is above this threshold, the road condition is reported as "damp".
- Wet Threshold: if the water film is above this threshold, the road condition is reported as "wet".
- Interference Suppression: the interval in ms for interference suppression
- Bluetooth Pairing: switching this setting to "off" will "unpair" the Marwis device with this iPad/iPhone

- Measurement Interval: the interval (in ms) in which the device calculates the measurement data and the data is transmitted to the app (range: 100...5000ms).
- Road Condition Model: the model used for calculating the road condition. Possible values are:
  - AVG
  - Winter 1
  - Winter 2
  - Winter 3
  - Summer 1
  - Summer 2

On the right hand side, the adjustment profiles of the device are shown and can be selected or adjusted.

Note that only valid profiles can be selected. Invalid profiles need to be adjusted to become valid. Invalid profiles are shown in gray.

Profiles can be adjusted by tapping on "adj."

Note that not all profiles can be adjusted – there might be factory presets that cannot be re-adjusted/overwritten.

Tapping on "adj." will open the "Adjustment/Alignment" dialog (see below)

### **Pyrometer offset**

Here the offset for the pyrometer temperature can be set. The temperature as reported by the pyrometer is shown.

Tapping the buttons has following effects:

- "—": decrease temperature offset (big step)
- "-": decrease temperature offset (small step)
- "+": increase temperature offset (small step)
- "++": increase temperature offset (big step)
- reset : reset temperature offset to 0

### **2.5.1 Adjustment/Alignment**

To adjust the sensor to the given kind/structure of the pavement/road surface in the area where the measurements will be taken, an adjustment process might have to be performed.

Without a properly conducted adaptation, the measurement data output might be erroneous.

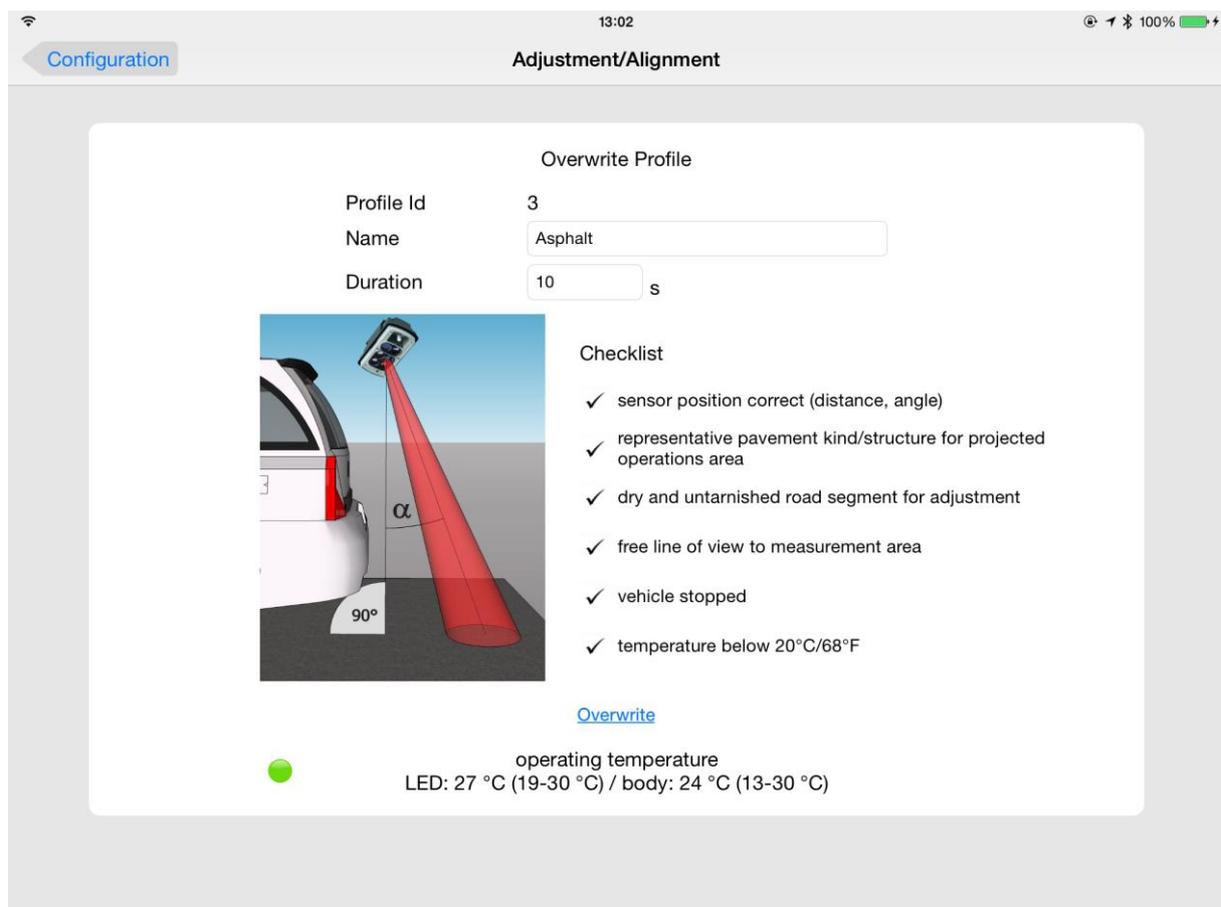
Following conditions must be satisfied:

- The Marwis device has to be installed on the measurement vehicle at the same position (especially: height) where it will be mounted for the measurements.

- The adjustment has to be run on a dry road.
- The vehicle must be stationary while the adaption process is in progress, i.e. the adaption process must not be performed when the vehicle is moving.
- The kind/structure of the pavement surface where the adaption is performed should be representative for the area where the measurement will be taken.
- The ambient temperature must be lower than 20 ° C.
- The adaptation must not be carried out in artificial light.

Up to 10 different adaption profiles can be stored in the Marwis device (some of which might be factory presets that cannot be overwritten).

During the adaption basic settings for the measurement process are calculated. These are dependent on the structure of the pavement/road surface and the distance between the Marwis device and the surface. It is sensible to name the profiles to reflect these conditions, e.g. the name of the vehicle used, and the height where the Marwis device was installed.



Only a name and the duration for the adjustment process can be set.

Note: the LED and body temperature of the Marwis-UMB device are checked/monitored and displayed.

If the LED and/or body temperature is below the valid range, a yellow/orange indicator is shown, and the "Overwrite" button is disabled. Please wait until the Marwis-UMB is heated up to the appropriate temperatures.

If the LED and/or body temperature is above the valid range, or the temperatures cannot be measured (e.g. because the temperature sensors are defective), a red indicator is shown, and the "Overwrite" button is disabled.

Only if the LED and body temperature is within the valid range, the "Overwrite" button is enabled, and a green indicator is shown.

Tapping on "Overwrite" will start the adjustment process. While the adjustment is in progress, the status (i.e. the time the process is running) will be displayed.

On successful completion, the screen will return to the device configuration dialog.

Note that the Marwis device needs to be re-started in order for the changes to become active.

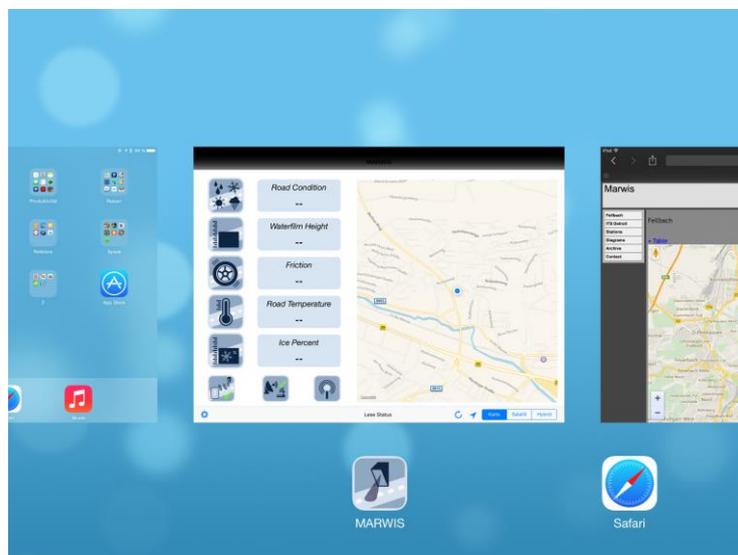
Leaving the device configuration dialog after running an adjustment process will prompt the user to reboot the Marwis device.

### 3 Stopping the App

The App is designed as a “dashboard” application, i.e. to show the measurement values and position while the measurements are taken.

However, the app will continue to read the measurement data from the Marwis device and forward the data to the server even if it is run in the background (home button was pressed) or the display is switched off.

In order to really stop the app from processing data the app must be stopped. Double-tapping the home button will show the running/active apps on the iPad/iPhone.



Swiping an app out of the screen to the top will terminate the app.

