USER GUIDE

DENDL® App

DENDL®
TECH FOR EASIER LIFE

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INTRODUCTION

This document is a **general user guide for DENODL®App, the digital twin management platform from which all DENODL®** systems are controlled and monitored.

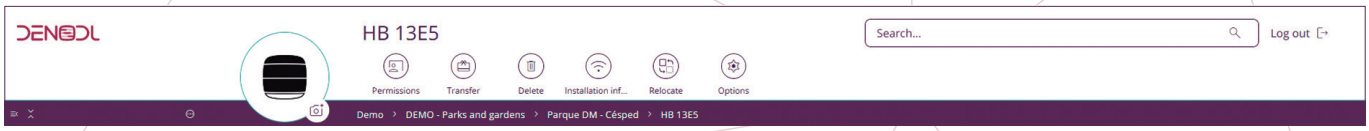
DENODL®App can be accessed from any device with internet access, either via the **web application: app.denodl.com,** using any browser, or by installing the **mobile app** on iOS or Android (available in the App Store and Google Play).

This document covers the following points:

- Visual structure of DENODL®App.
- Structure of the digital twin.
- Creation of the digital twin.
- User administration.
- Permission management.
- Transfer and deletion of units or measurement elements.
- Adjustment of the interface for data analysis.

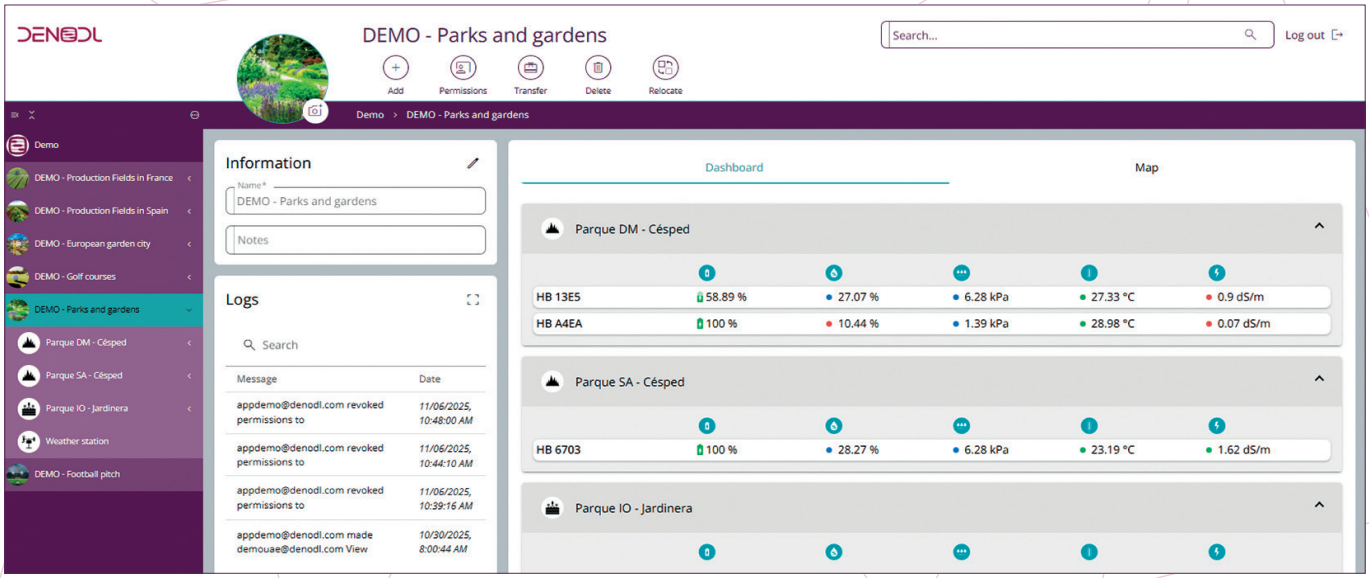
VISUAL STRUCTURE OF DENODL®App

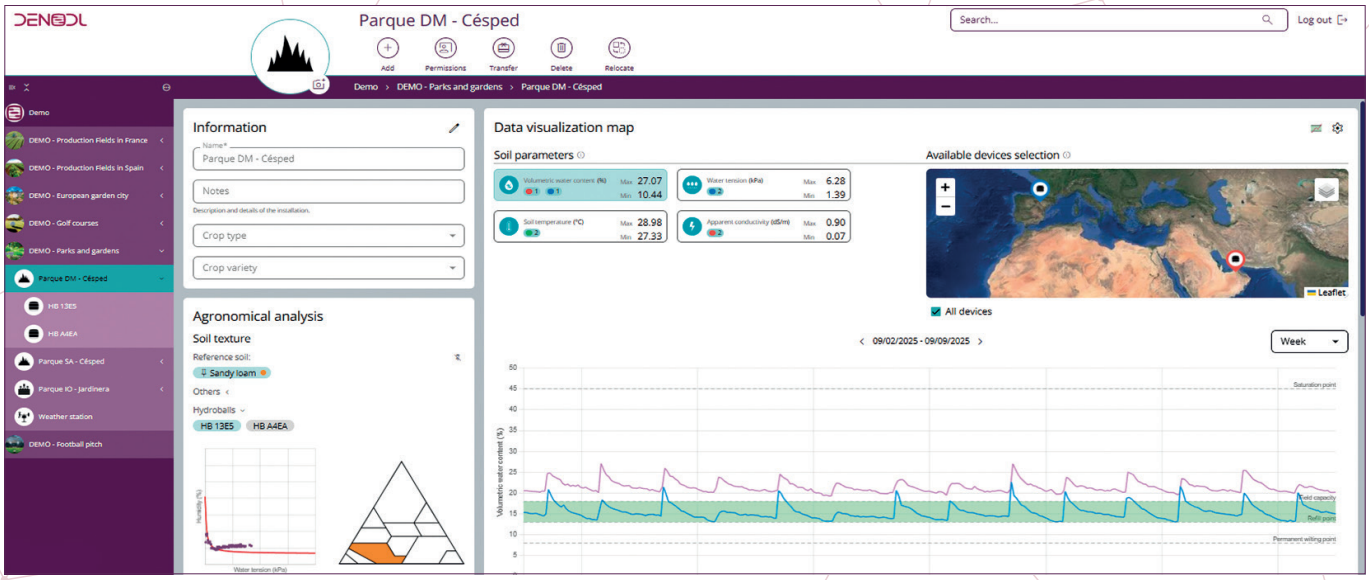
All screens in DENODL®App have three main parts:



- **HEADER:** This is where you will find the image and name of the element being displayed, as well as the various control buttons for the element.

  - **Add:** allows new units to be incorporated into the digital twin.
  - **Permissions:** allows sharing the digital twin with other users.
  - **Transfer:** allows transferring ownership of the digital twin from one user to another.
  - **Delete:** allows deleting units or the entire digital twin.
  - **Installation information:** allows consulting the activation period and adaptive mode of the probe.
  - **Relocate:** allows reorganising the display of information by moving units or elements within the digital twin.
  - **Options:** allows selecting the soil type for the control point.





- **SIDE MENU:** located on the left and containing the structure of the digital twin, made up of its different units. To navigate through each unit, click on them.

- **DISPLAY AREA:** this is the main part of the application, where all the data from each unit is displayed, as well as the probe metrics. The main unit (golf course, sports facility, park, city garden, farm, etc.) displays a summary of the status of all the sensorised areas.

STRUCTURE OF THE DIGITAL TWIN

The digital twins of DENODL® are based on a structure of units organised hierarchically and contained within one another. This hierarchy is represented in the side menu, from which you can navigate to each of them.

The hierarchy of units according to the sector of application is as follows:

SECTOR OF APPLICATION	GOLF	FOOTBALL	AGRICULTURE	PARKS AND GARDENS	URBAN
MAIN UNIT	GOLF COURSE	SPORTS FACILITY	FARM	PARK	CITY GARDEN
ORGANISATIONAL UNIT	HOLE	FOOTBALL PITCH	PLOT	AREA	SECTOR URBAN
MANAGEMENT UNIT	FAIRWAY, FRINGE, GREEN, ROUGH, TEE	FOOTBALL AREA	CROP	TREES, LAWN, FLOWERS, SLOPE	TREES, LAWN, FLOWERS, SLOPE
MEASUREMENT ELEMENTS	MEASUREMENT ELEMENTS	MEASUREMENT ELEMENTS	MEASUREMENT ELEMENTS	MEASUREMENT ELEMENTS	MEASUREMENT ELEMENTS

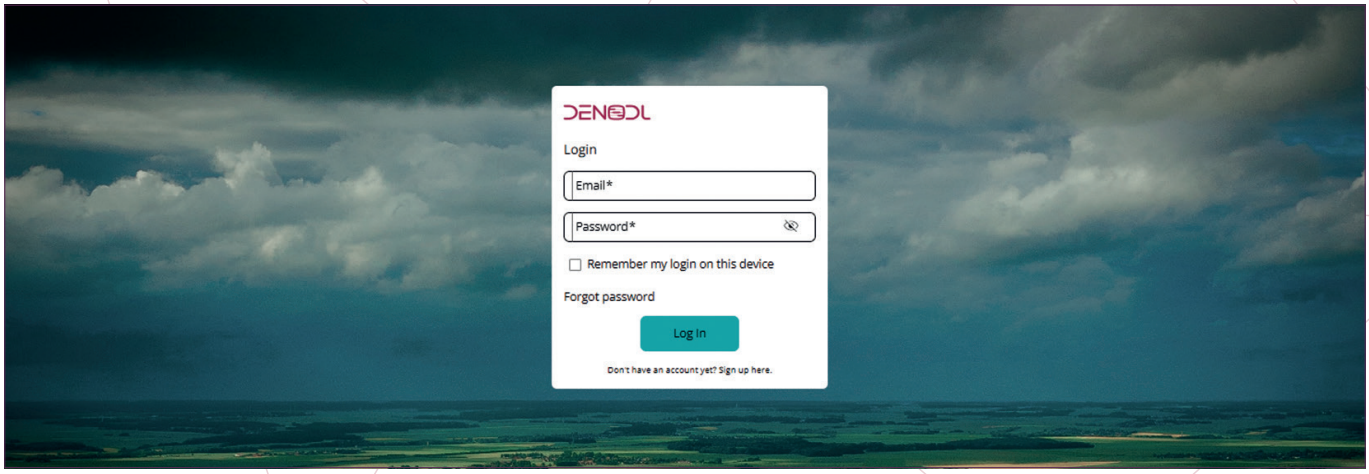
CREATION OF THE DIGITAL TWIN

The steps required to create a new digital twin in the **DENODL®App** platform are:

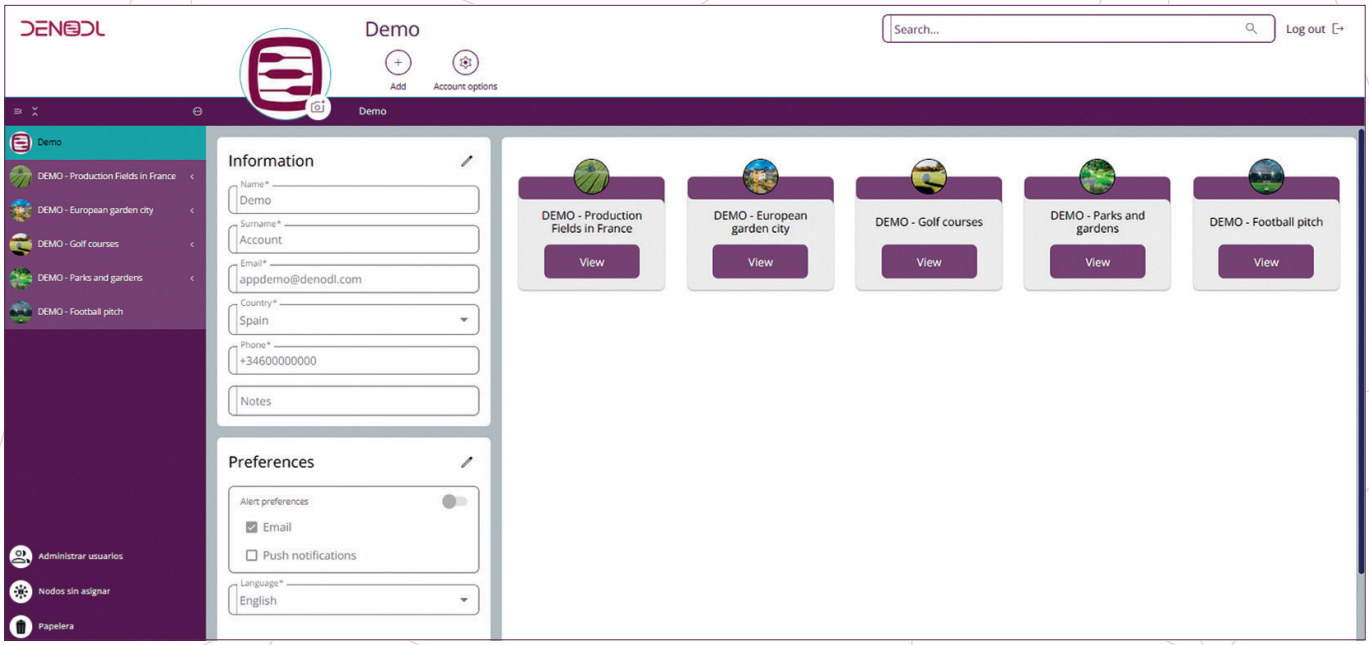
- Log in.
- Delimitation of the main unit.
- Delimitation of the organisational units.
- Delimitation of the management units.
- Pairing of probes and measurement elements.

Log in.

Log in to DENODL®App by entering your credentials (initially provided by the distributor). You can access **DENODL®App** via the **web application: app.denodl.com,** or by installing the **mobile app** on iOS or Android (available on the App Store and Google Play).



After logging in, a screen will appear showing the **user's information and preferences,** from which you can start generating the digital twin.

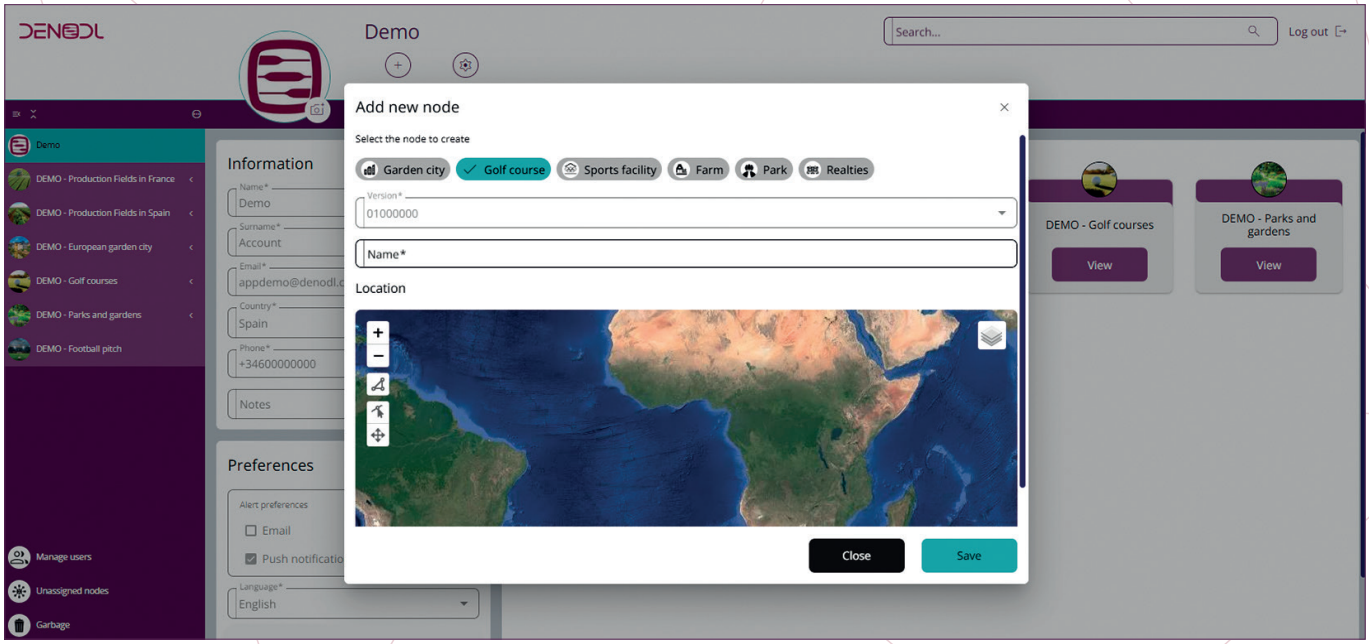


Delimitation of the main unit.

The main unit is the element that groups together the rest of the digital twin. The name of the main unit is differs for each sector of application. **To define it, use the "add" button** located in the header of **DENODL® App**.

- **Golf:** Golf course.
- **Football:** Sports facility.
- **Agriculture:** Farm.
- **Parks and gardens:** Park.
- **Urban:** City garden.

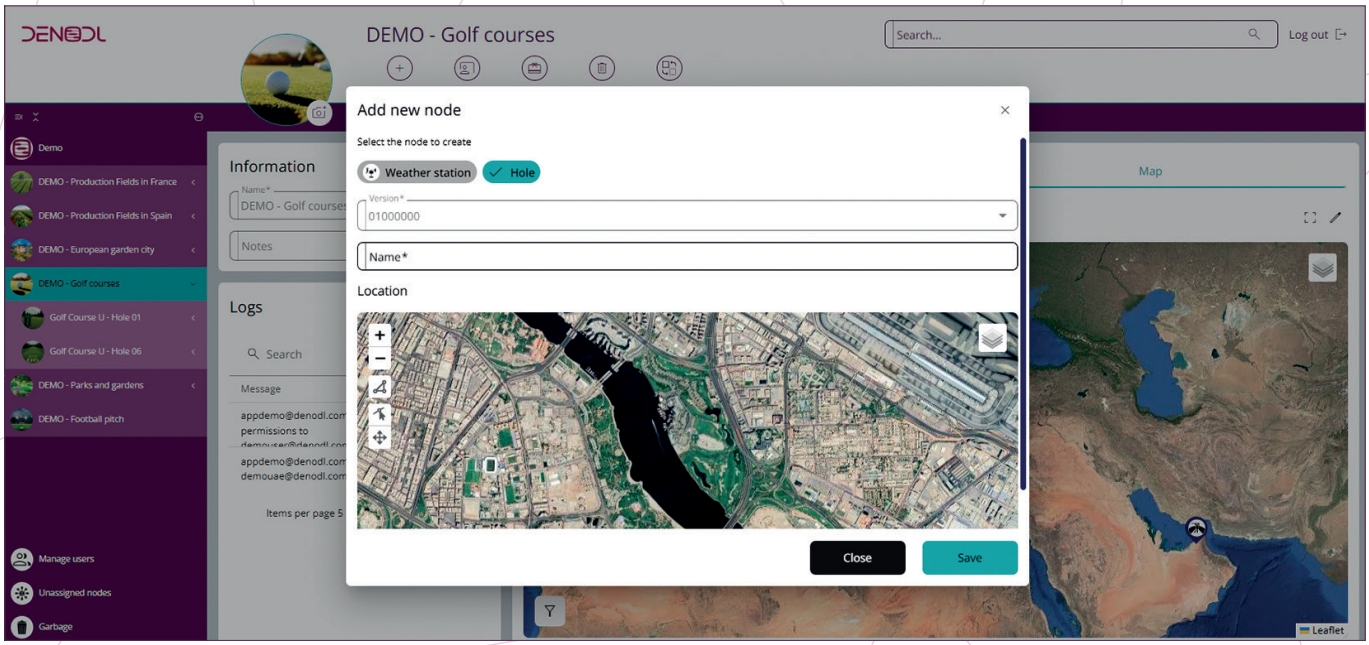
In the pop-up window, **click on the main unit of the digital twin according to the sector of application, enter its name in the corresponding field and draw its geometry on the map.**



Delimitation of the organisational units.

Organisational units are defined from the main unit screen. These are elements (in some cases optional that **are used to organise other lower-level elements within them.** They are created using the same button and options as the main units. There are different organisational units for each main unit:

- **Golf course: hole.**
- **Sports facility: football pitch.**
- **Farm: plot.**
- **Park: area.**
- **City garden: urban sector.**



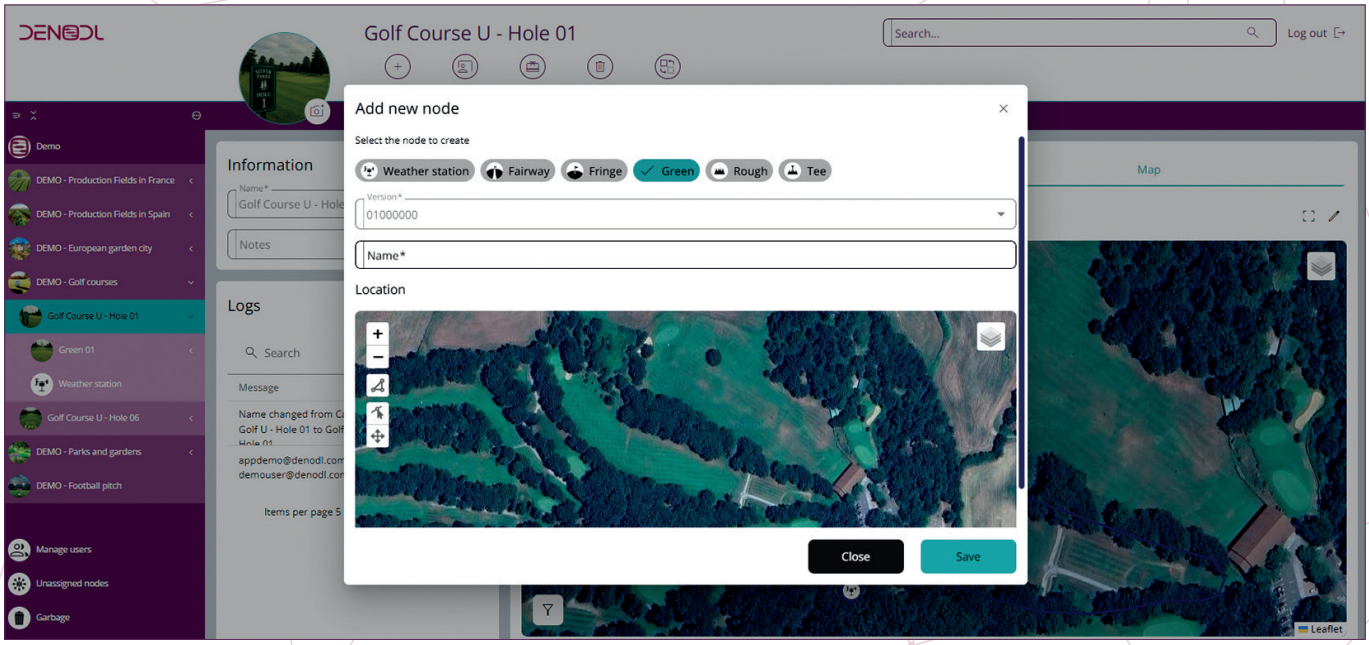
Delimitation of the management units.

Management units are defined from the corresponding organisational unit screen. **The management unit is the element in which all the information from the probes will be displayed. In general, management units correspond to existing irrigation sectors.**

To delimit a new management unit, click on the "add" button on the screen of any organisational unit. This will create a new management unit within the element from which it is created.

Clicking on the button will bring up a window that will allow you to **define the name, location and geometry of the element,** in the same way as with the main unit and the organisational unit.

(See image on the next page).



Pairing probes and measurement elements.

Each probe is paired with the software using its Alt. ID (unique serial number), which ensures accurate control and avoids duplication in data recording.

(Important: a probe can only be paired to one crop or irrigation sector at a time, also called a management unit).

If you want to reuse a probe in another irrigation sector (for example, by physically moving it from one place to another), you must **first edit the Alt. ID field of the sector from which it has been uninstalled.** To do this, edit the Alt. ID field by adding the current date to the end of the 16-digit alphanumeric code (for example: 010300081E1245B6.16.05.2025). To finish, **save the changes** by clicking on the save icon located in the top left corner of the information section.

(Important: if you try to pair the probe directly to a new sector without performing this step, the software will display a pairing error, as it detects that the serial number is already associated with another location).

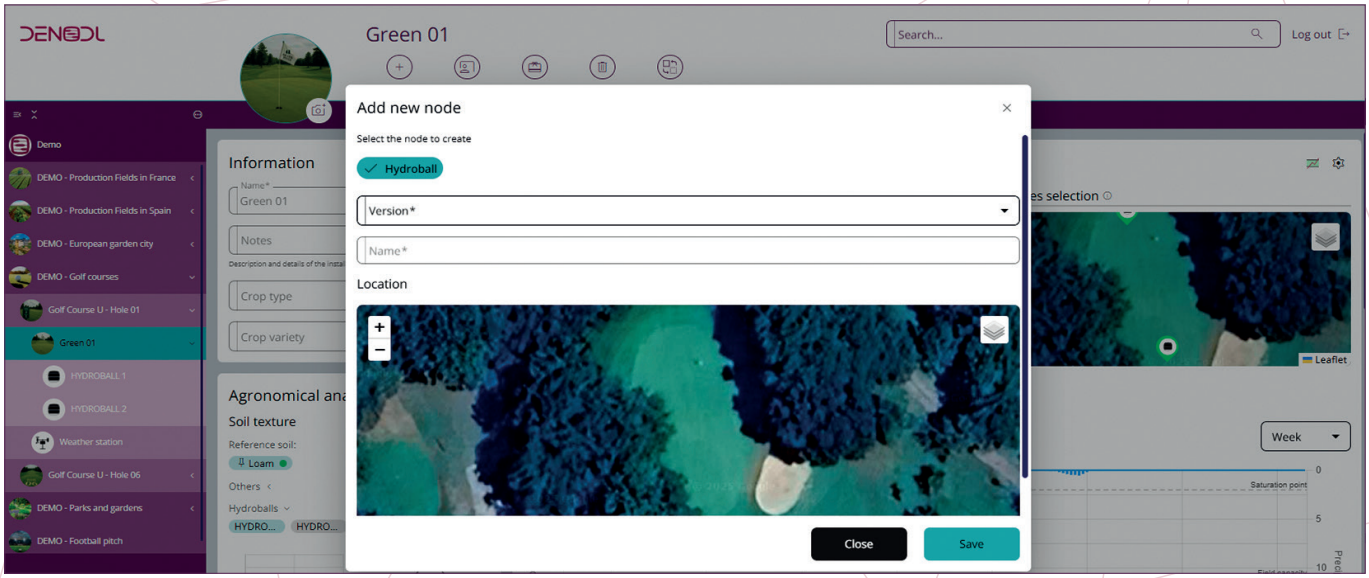
Pairing a probe or measurement element

You can add probes to the digital twin from any management unit or irrigation sector. They can be added both from the web app and the mobile app, just like other elements.

From the web app, the process is the same as for creating all previous elements. **To add a probe, click on the "add" button** and a window will appear allowing you to **select the type of device, the version** (the probe version corresponds to the first four numbers of the serial number), **the name, the Alt. ID** (serial number, which you will find engraved on the body of the probe or on the delivery note, corresponding to the 16-digit alphanumeric code), **set the measurements according to soil texture, installation depth and location** (control point).

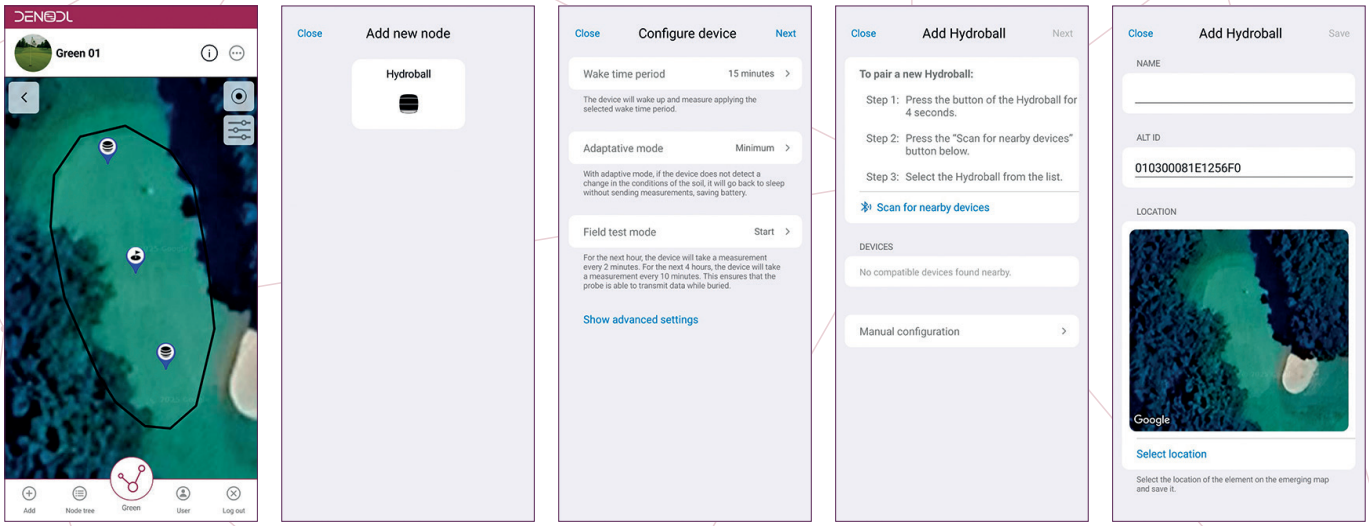
*(Important: the Alt. ID is the code that pairs the probe with the **DENODL®App** software. If the serial number is entered incorrectly or is deleted, the data collected by the probe will not be recorded in the App).*

(See image on the next page).



To add probes using the DENODL®App mobile app, the mobile phone's Bluetooth and location services must be enabled. **Probes are paired from the management unit screen by pressing the "add" button** located in the bottom left corner.

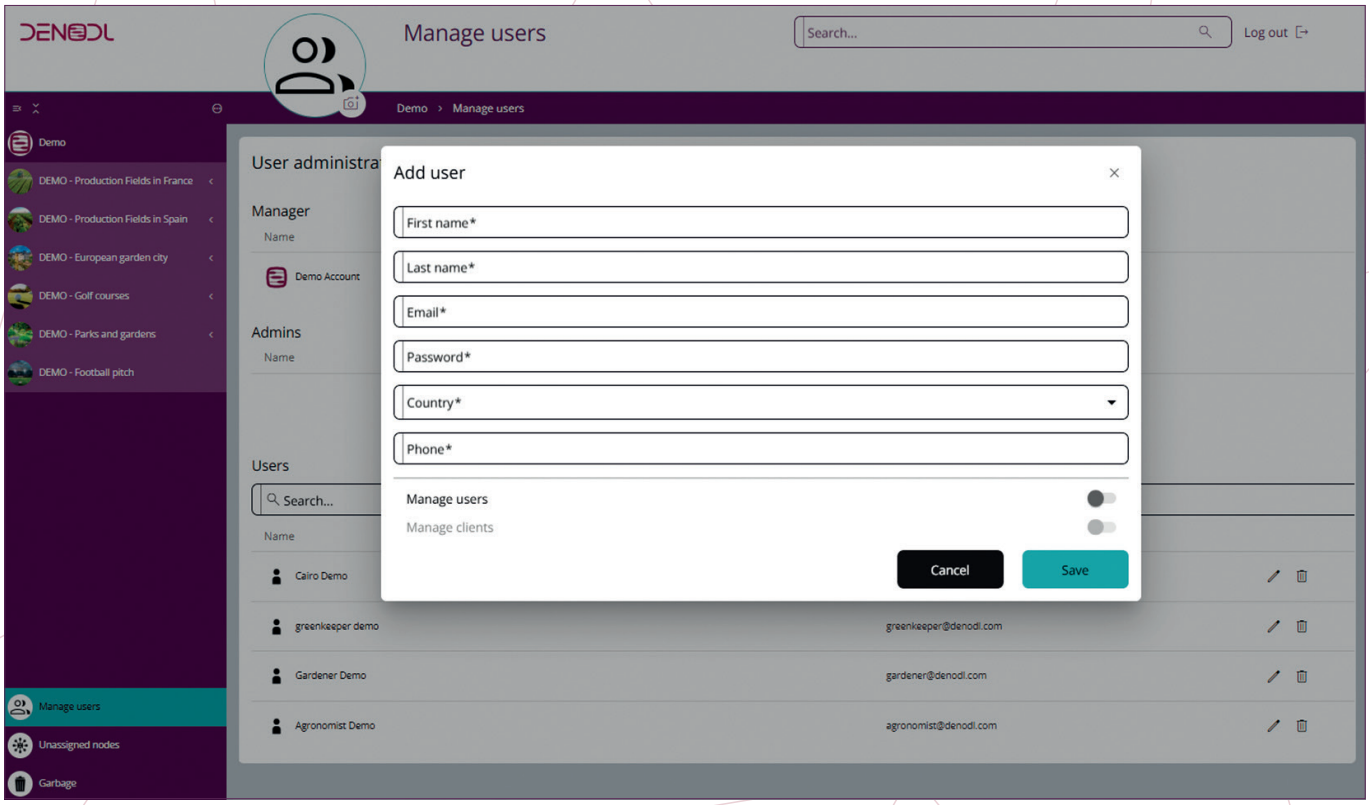
The screen flow for pairing the HYDROBALL® is as follows:



In addition, when creating the digital twin, a virtual weather station is automatically added, which collects data from real weather stations via APIs for monitoring purposes.

USER ADMINISTRATION

It is possible to **manage users** from those accounts that have been registered as **“user administrator”.** In this case, a **“user administrator” button** will appear at the bottom of the side menu, granting access to the user administration screen. **From this screen, existing users can be viewed, edited, deleted, and new users can be added.**



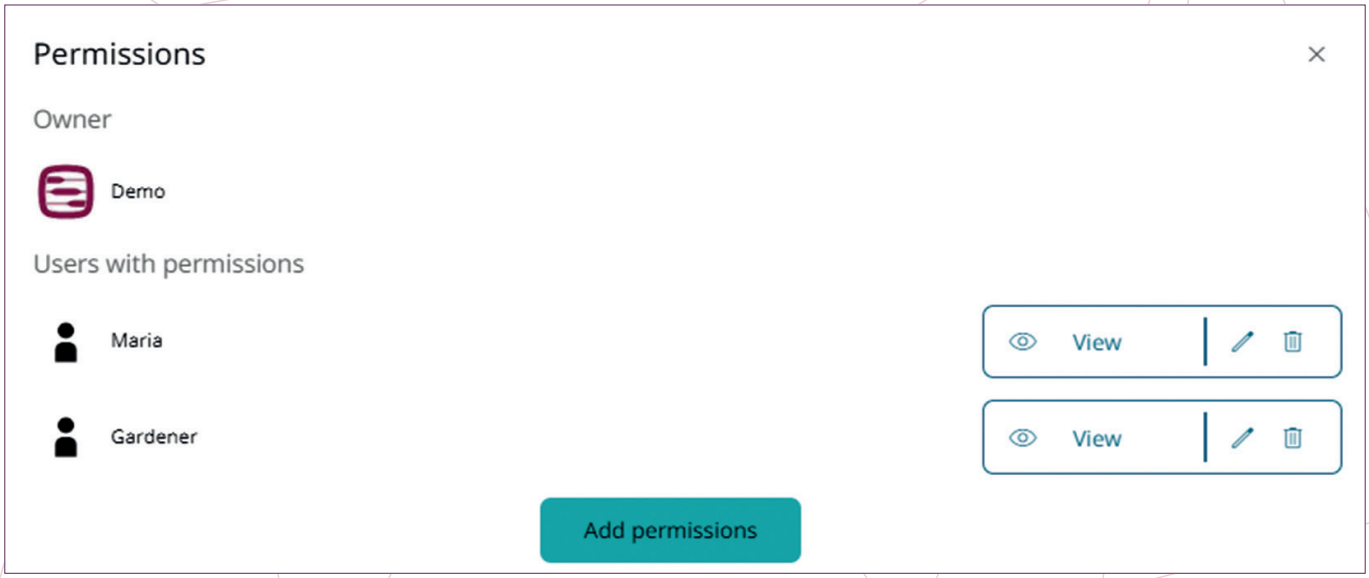
To register a new user, click on the “add user” button in the top right corner. The following window will appear, where you can fill in the new user's details and choose whether or not they will be a user administrator (which would allow the new user to register other users).

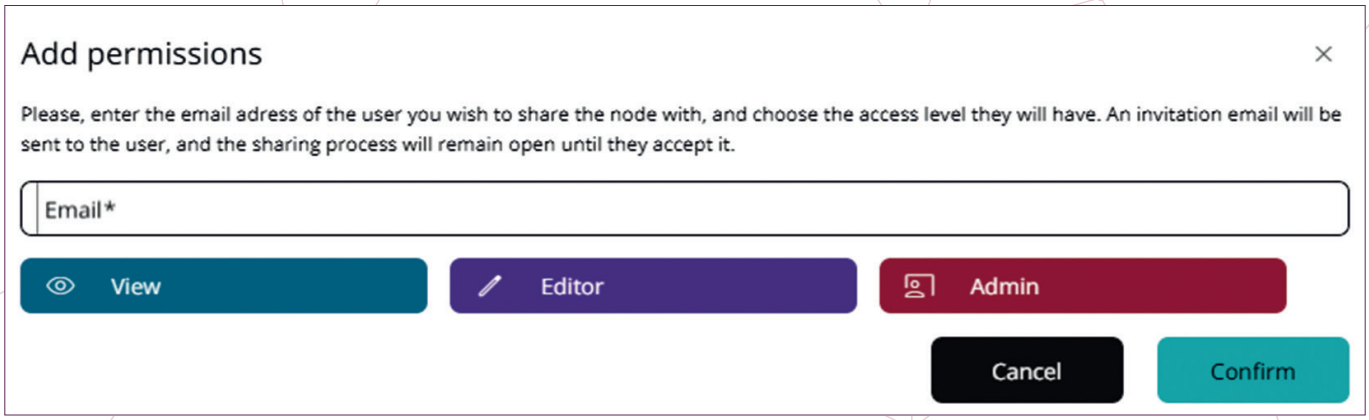
PERMISSIONS MANAGEMENT

DENODL® App has an integrated **permissions management system, through which other users can be given access to different levels of the twin's hierarchy (units).** In addition, it is possible to limit the management capabilities that each user has over each element. This allows each user to perform specific actions on the elements to which they have access.

To grant permissions for an element, navigate to it and click on the **“permissions” button** located in the header. The current permissions window will be displayed. From this window, you can edit and delete existing permissions and add permissions for new users with the “add permissions” button.

(See image on the next page).





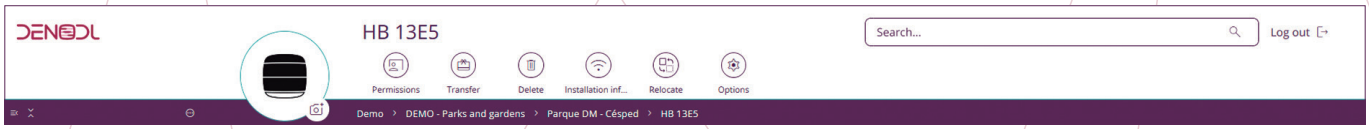
There are four levels of permissions for the same element:

- **Owner:** the user who owns the element, either because they created it or because another user has permanently transferred it to them. This cannot be modified using the permissions button.
- **Administrator:** they can perform the same actions on the element as the "owner".
- **Editor:** they can edit the element's fields, but cannot delete it, transfer it or grant permissions for it.
- **Viewer:** they can access the element and view its information, but cannot delete it, transfer it, grant permissions for it, or edit any fields.

The unit or measurement element for which permissions have been granted will appear in the account of the user receiving them, in the section **"unassigned nodes"**, located in the bottom left corner of the side menu. **From there, permissions for the unit or element can be accepted or rejected.**

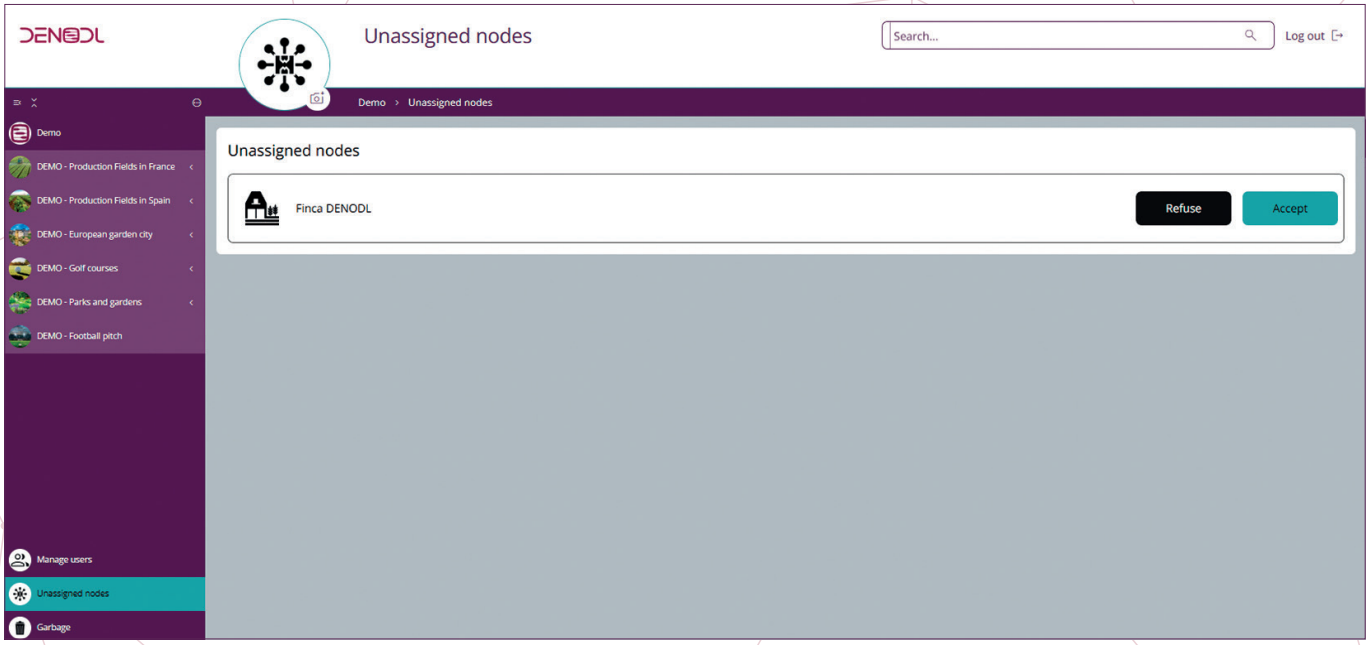
TRANSFER AND DELETION OF UNITS OR MEASUREMENT ELEMENTS

Any unit or measurement element in the hierarchy can be transferred to another user or deleted by users who have a sufficient permission level. The transfer and deletion buttons are located in the header.



To transfer, enter the email address of the other user in the pop-up window.
When a unit or measurement element is transferred, it will appear in the “unassigned nodes” space of the other user until they accept or reject the transfer. Once the transfer is accepted, they will become the new owner of that unit or element.

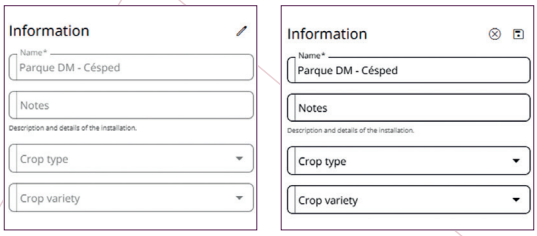
When an element is deleted, it will be moved to the recycle bin, from which it must be permanently deleted.



ADJUSTMENT OF THE INTERFACE FOR DATA ANALYSIS

Editing fields.

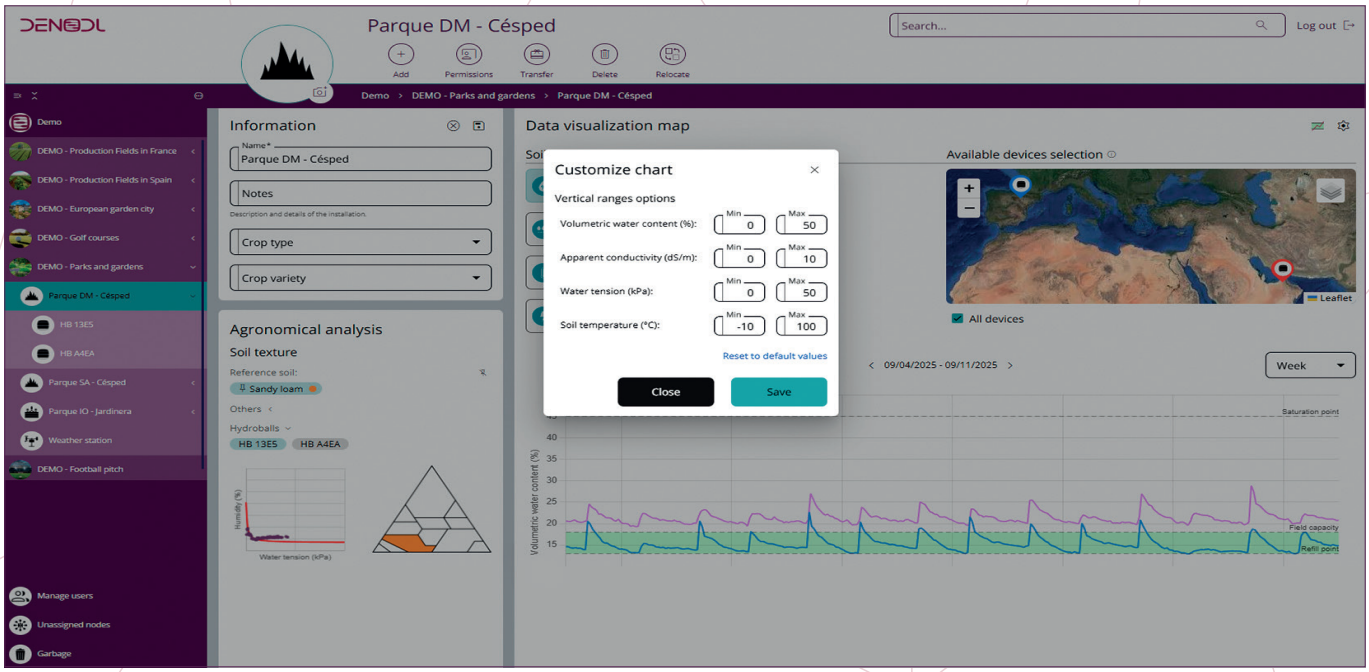
All fields that define the different units or measurement elements of the digital twin that are editable are marked with a pencil icon. To edit a field, click on the pencil icon located in the top right corner of the field in question. Then click on the save icon located in the same place.



Customisation of graphs.

Edit the range of the vertical axis of the graph for each parameter (minimum and maximum) in order to facilitate data analysis. If the range set is too wide, it may not be possible to correctly appreciate the variations in the dynamics of each parameter recorded by the probe.

To customise the minimum and maximum of the vertical axis of the graphs, click on the gear icon located in the top left corner of the data display map section in the management unit or in the statistics section if you are navigating the measurement element screen.

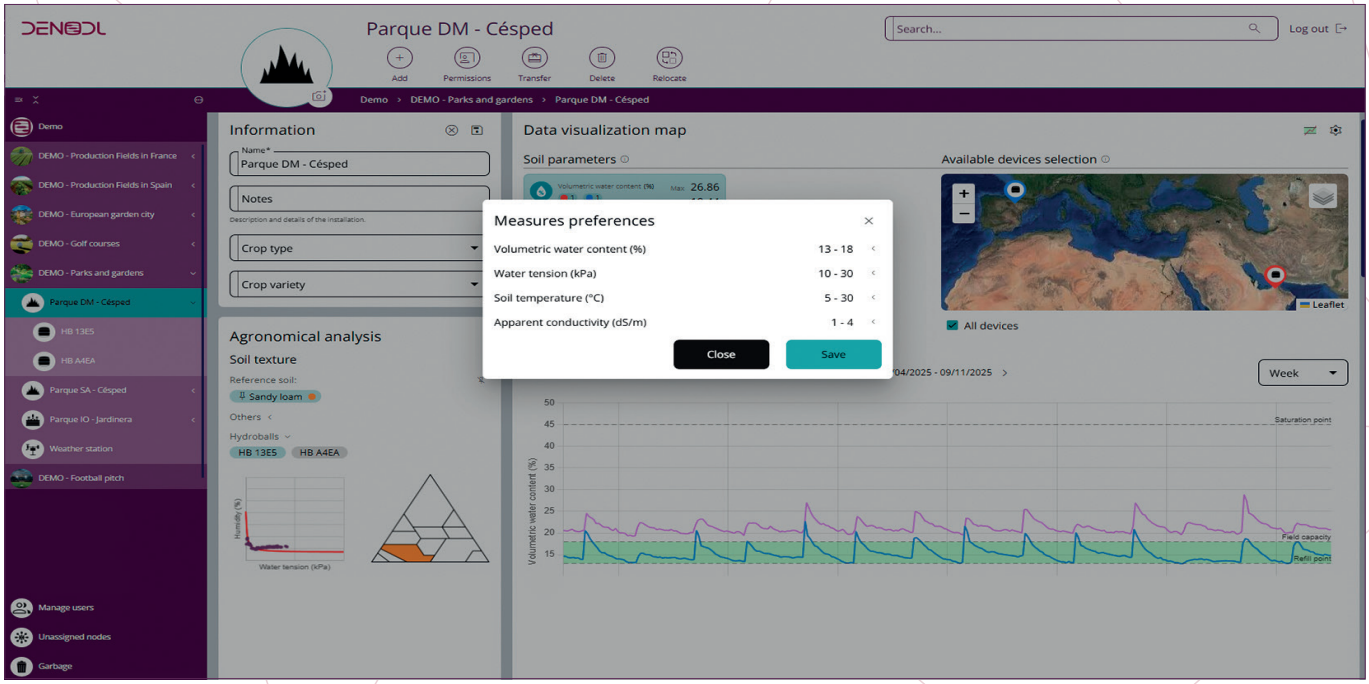


Adjustment of optimal working ranges.

Configuring the optimal working range allows you to see the soil status at a glance and set alerts.

The optimal working range is represented in the graph for each parameter in question as a green band.

This range is adjusted in the management unit by clicking on the green icon located in the top left corner of the "data display map" section, next to the gear icon.



Characteristic curve or soil moisture retention curve.

At the management unit level of the digital twin, there is an **section on "agronomic analysis".**
This section plots the **characteristic curve of the sensorised soil at each control point.** This curve represents the **relationship between the soil water content (volumetric water content, %) and the matric suction (water potential, kPa), allowing you to know your soil's water retention capacity.**

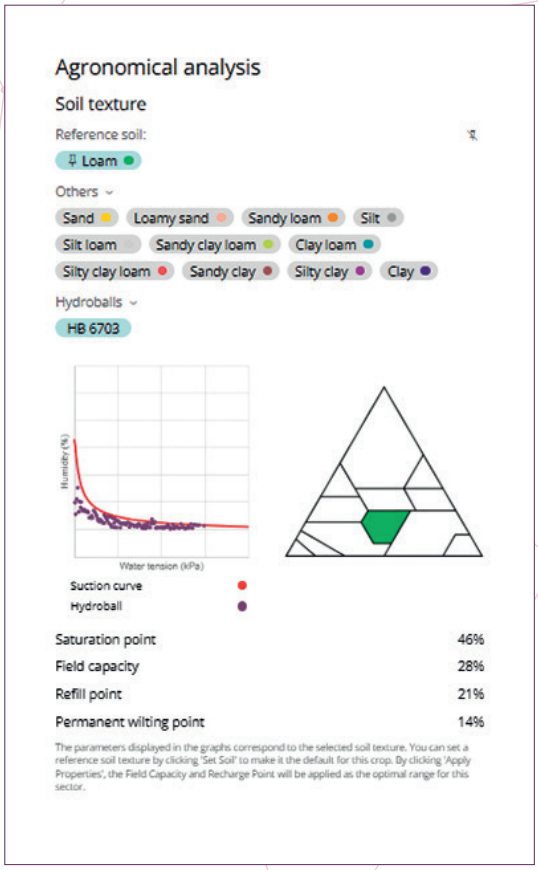
In addition, in this section you can compare the characteristic curve of your soil with the twelve curves standardised by the USDA according to their composition and find out the theoretical water retention parameters of the soil (saturation point, field capacity, recharge point and permanent wilting point). In other words, **you can compare your soil's water retention capacity with the water retention capacity of the twelve standardised soils. This will give you a theoretical understanding of the volumetric water content (%) at the saturation point, field capacity, recharge point and permanent wilting point.**

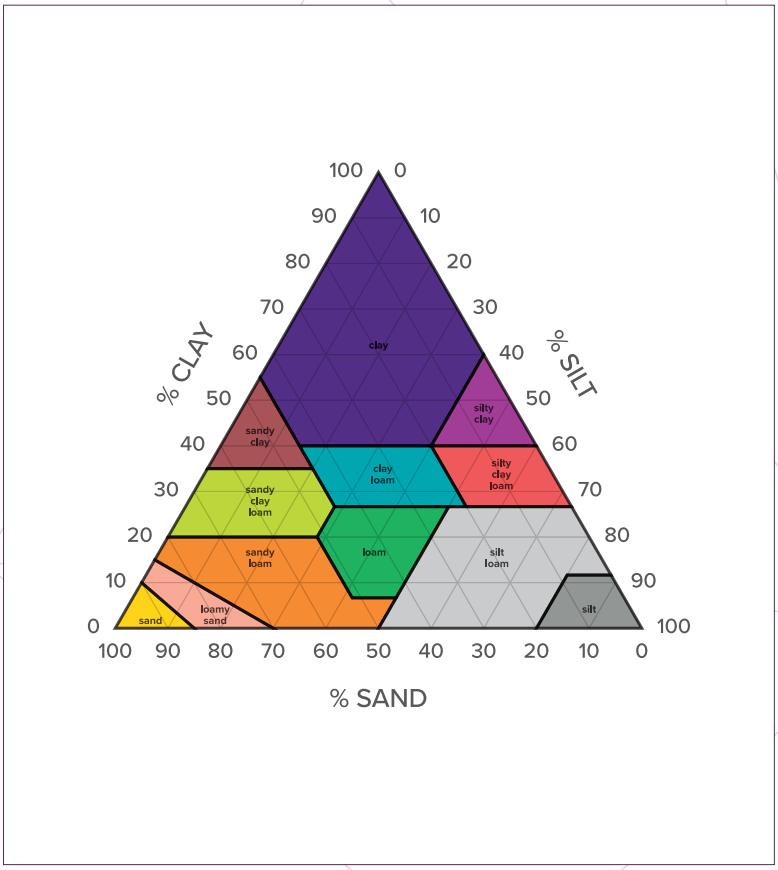
Selecting the characteristic curve for the soil type that is most similar

You can do this manually or automatically for each hydroball:

- **Manually:** click on each soil type and observe which standardised characteristic curve (red) best matches your soil curve obtained via the probe (purple).
- **Automatically:** click the "wand" icon, and the soil type with the standard characteristic curve most similar to the real one (purple) will be automatically selected. (If there is insufficient variability in water dynamics, the soil characteristic curve cannot be automatically selected).

Once the soil type has been selected, click on the **"pin" icon to lock the soil.** This will plot the theoretical saturation point, field capacity, recharge point, and permanent wilting point as dashed lines on the volumetric water content (%) graph.



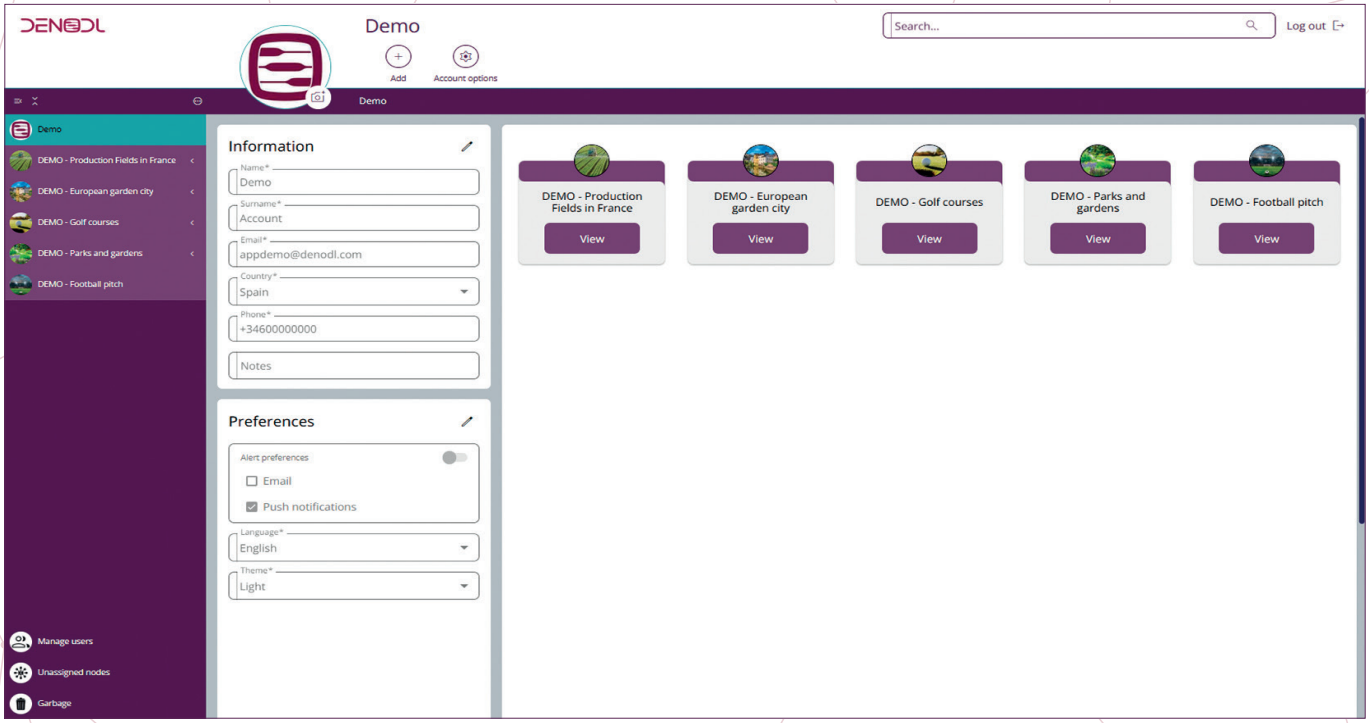


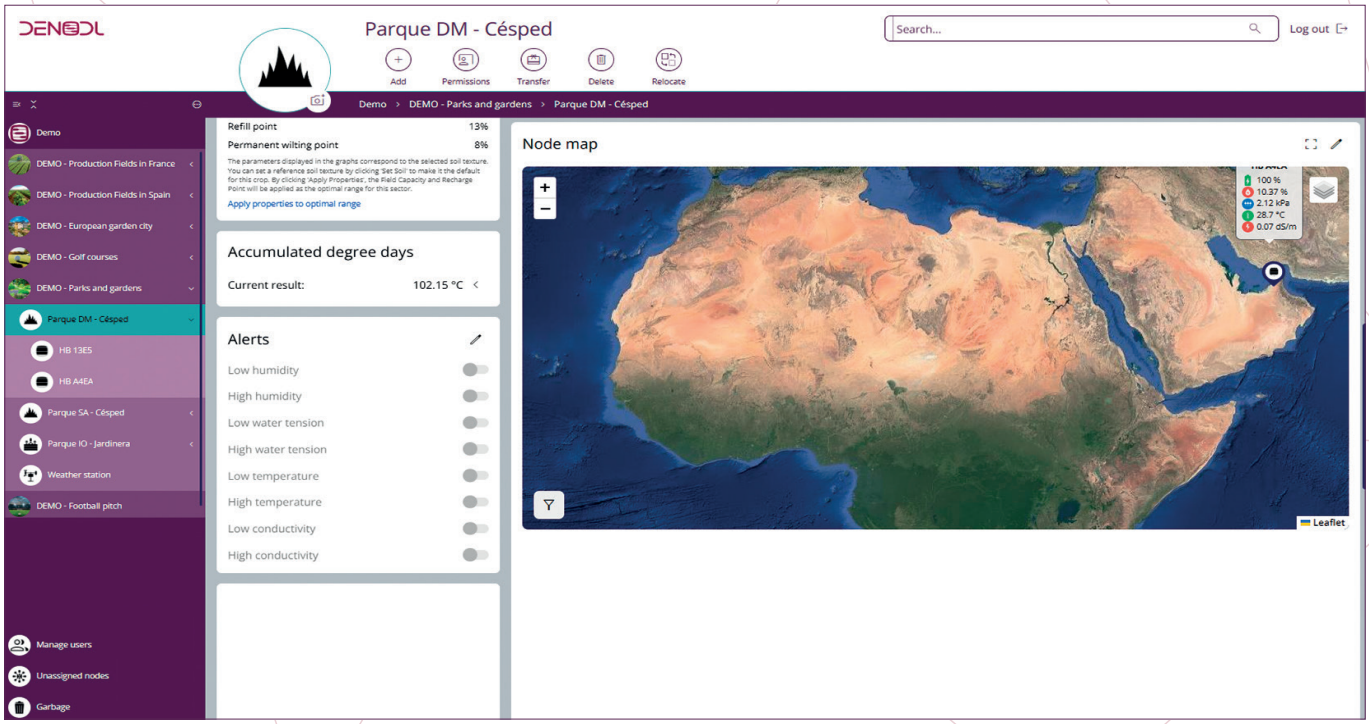
Activation of alerts.

Activate alerts to receive notifications based on the optimal working ranges (green band) for each parameter collected by the probe. You will receive an alert when the soil status (volumetric water content, water potential, apparent electrical conductivity or temperature) is outside the established optimal range, enabling you to make decisions and take action in the field.

To activate alerts, first **select how you want to receive notifications** from the home screen in the “preferences” section. Then, in the management unit screen, click on edit in the “alerts” section, **select the alerts you want to activate and, finally, save your selection.**

Recommendation: on the measurement element screen (e.g. HYDROBALL®), we recommend activating the “battery below 20%” alert, so that you can change the sensor batteries, and “24-hour disconnection” in case you need to report a possible issue.





ACCESS DENODL®App

Access **DENODL®App** from any device with internet access.

Web application: app.denodl.com

Mobile app on iOS: App Store.

Mobile app on Android: Google Play.

MANUFACTURER INFORMATION

Company name: **Fernando Sarría Agrotechnologies S.L.**
Brand name: **DENODL®**

For any queries or requests for assistance, please contact your authorised distributor or the manufacturer's Technical Support Service.

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www.denodl.com

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