



SIMCAD
SIMULADOR MSM

USER MANUAL

SIMCAD



USER MANUAL

REF: SIMCAD-MAN-ENG

Rv. 01

Rv.	DATE	REVISION
01	05/08/2026	Initial version

INDEX

SIMCAD

1.	INTRODUCTION	1
2.	PROGRAM	1
3.	TOOLBAR	5
3.1	FILE.....	5
3.2	TOOLS	6
3.3	HELP	6
4.	PROJECT	7
5.	BUOY FAMILY	8
6.	CHAIN FAMILY	10
7.	SIMULATION.....	11



1. Introduction

Thank you very much for choosing an **MSM product**!

MSM is a modern and innovative company, mainly dedicated to the design and manufacture of equipment for **maritime and inland waterway navigation aids**.

Established in 2006, **MSM** is currently the manufacturer with the largest range of marine signalling products on the market. We manufacture all types of navigational aid equipment, the necessary complements for its proper operation, together with its marketing and training and maintenance services.

In addition, all our products are designed and manufactured under the recommendations of the International Maritime Signalling Association (IALA-AISM).



2. Program

Simcad is a program for calculating and studying the viability of the buoy + chain assembly under certain environmental circumstances and specific characteristics of each of the elements that make up the assembly. We can also check the forces exerted on the buoy, as well as calculate the minimum length of the chain that we will need and its associated cost, the calculation of the sinker that we will need, etc.

The equipment is calculated in accordance with the Recommendations of the International Association of Maritime Signalling (AISM - IALA) and the "*Technical Standards on Works and Installations of Aids to Navigation*" of the MOPU. Specifically, IALA Recommendation E-107 and Guideline 1066 apply. The calculation process has been carried out by applying these regulations automatically and thus optimising the performance of simulations and calculations.

To this end, our program includes the MSM buoy catalog, as well as a set of libraries with the most used chains. With this information we will be able to carry out different simulations according to our needs in each project.

It is also a program open to the needs of the user since it incorporates the possibility for each customer to incorporate their own family of buoys or chains. You can include as many elements as you deem necessary to tailor it to your specific needs.

The main screen of the **SIMCAD** application is as follows:

Figure 1: Main screen

The application is distributed in 4 tabs that correspond to each of the four steps that must be completed to perform a simulation. You must complete each of the four steps correctly in order to perform a feasibility simulation.

To perform a successful simulation, you must complete each of the steps indicated below:

- Review the application settings to verify the simulation parameters.
- Complete the buoy's location data .
- Select the family and buoy we want to use.
- Select a string family and model that you want to test.
- Simulate.
- Export the simulation data.

The settings of the app can be found in the toolbar at the top, and the screen is as shown below:

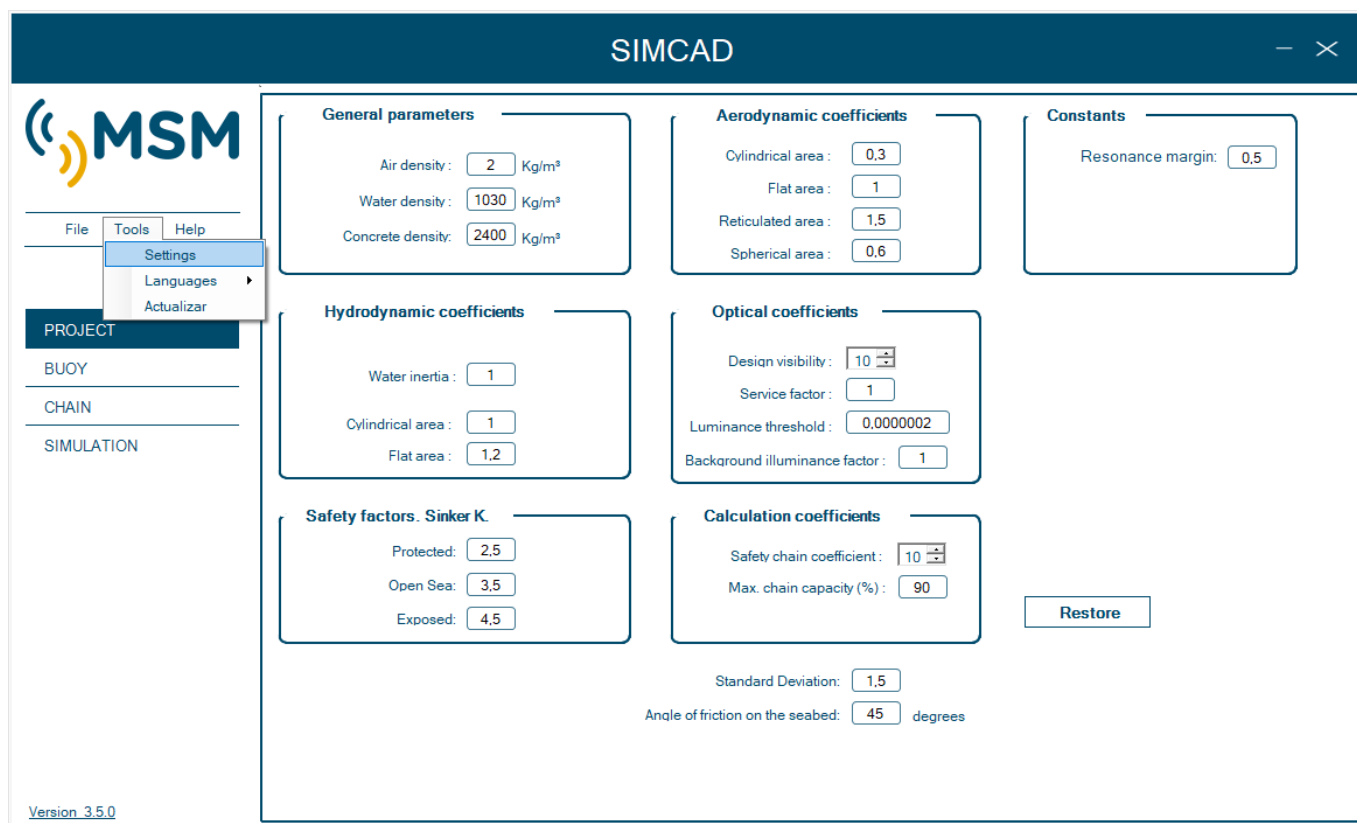


Figure 2: Configuration screen

Make the appropriate modifications, but with knowledge of the facts since wrong parameters can lead to a simulation of the disaster. The parameters shown by default are valid for most situations.

The default parameters that can be modified are:

- Air density: 2 Kg/m³
- Water density: 1030 Kg/m³
- Concrete density: 2400 Kg/m³

- Water inertia: 1
- Hydrodynamic coefficient for a cylindrical area: 1
- Hydrodynamic coefficient for a flat area: 1.2

- Safety factors. Sinker K (Protected): 2.5
- Safety factors. Sinker K (Open Sea): 3.5
- Safety factors. Sinker K (Exposed): 4.5

- Aerodynamic coefficient for a cylindrical area: 0.3
- Aerodynamic coefficient for a flat area: 1
- Aerodynamic coefficient for a reticulated area: 1.5
- Aerodynamic coefficient for a spherical area: 0.6

- Design Visibility: 10
- Service factor: 1

- Luminance threshold: 0.0000002
- Background Illuminance Factor: 1
- Safety chain coefficient: 10
- Max. chain capacity %: 90
- Resonance Margin: 0.5
- Standard deviation: 1.5
- Friction angle on the bottom: 45 degrees



3. Toolbar

Using the toolbar, we can access new functions of the program. We can load or save a simulation, generate and export a report, and switch languages.

3.1 File

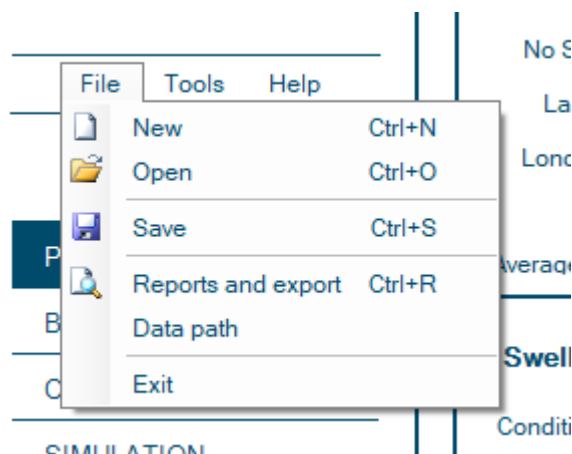


Figure 3: File

- **New:** It prepares the program to perform a new simulation by deleting all information from previous simulations.
- **Open:** With this option we can open a previously saved simulation file. The simulation files have the extension ".msm" and contain all the data needed to retrieve the results. When opening a file, we have to choose between using the file settings preferably or the program's settings. The main difference is:
 - **File configuration:** In this case, the original values of the configuration that was originally used are used, as well as the values of the buoy and chain used. If you use this option, note that the values of the current configuration can be modified, so you will have to review them in future simulations in case they are not suitable.
 - **Program settings:** The configuration of the program, the family of buoys and chains available in the program is used, in such a way that, if we load a simulation of the "X" model and it is available, the original values of the program will be used.
- **Save:** After performing a simulation, we can save the results in a ".msm" file to retrieve them later.
- **Reports and export:** Opens a window where you can view a summary of the simulation performed, as well as export it to .pdf format.
- **Data path:** Opens a new window to select the directory that contains the project folders and data for buoy families and chains. The selected folder must contain at least the "data" directory and within it the "cfc" and "cfc" folders.

- **Exit:** closes the program.

3.2 Tools

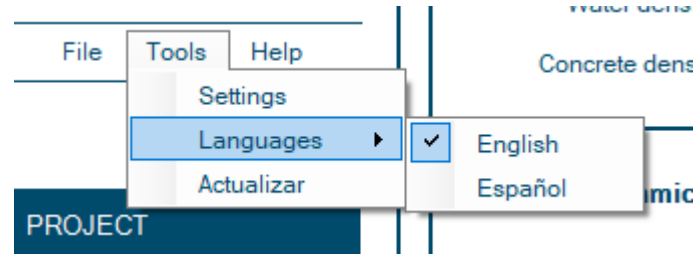


Figure 4: Tools

- **Languages:** Allows you to select the language of the program interface.

3.3 Help

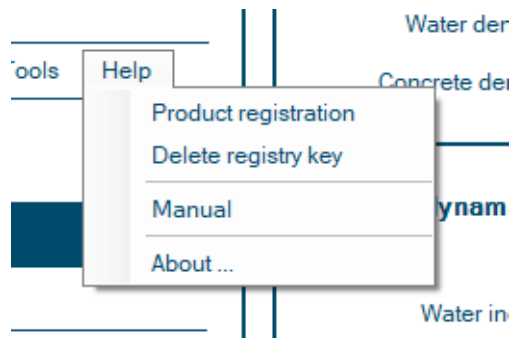


Figure 5: Help

From the Help menu we can access the help content, as well as register or delete the product and see the user manual.

When you start the program for the first time, you will need to enter a valid key from your provider.



4. Project

The first step in any simulation is to complete the information that will identify our project, you will not be able to complete the rest of the sections unless you have previously completed the information shown below:

The screenshot shows the SIMCAD software interface. The title bar at the top says "SIMCAD". On the left is a sidebar with the MSM logo and a menu with options: File, Tools, Help, PROJECT (highlighted), BUOY, CHAIN, and SIMULATION. The main area is divided into three sections: "Project", "Swell and wind data", and "Wave data for advanced dynamics". The "Project" section contains input fields for Location, Date, No Signal, Latitude, Longitude, Tide (with a unit of m.), and Average depth (with a unit of m.). The "Swell and wind data" section has a "Conditions" dropdown menu set to "Protected", and input fields for Maximum wave height (m.), Significant wave height (m.), Maximum current speed (with a unit of m/s), and Maximum wind speed (with a unit of km/h). The "Wave data for advanced dynamics" section has input fields for Wave period (s.) and Wave length (m.). On the right side of the main area, there is a large box with the SIMCAD logo and the text "SIMULADOR MSM". The version "Version 3.5.0" is displayed in the bottom left corner.

Figure 6: Project

The first part corresponds to the identification data corresponding to the location where we want the buoy. These are identifying data of the place and environmental conditions. The location field refers to the place where the buoy is going to be placed, the longitude and latitude fields will establish a more specific position. The tide field is the maximum tidal run value, and the average depth is the average height to the seabed.

In the second part we will introduce the data corresponding to the wind and waves suffered by the area. The first thing is to select the conditions that the buoy is going to suffer, we can select between "**Protected**", "**Open Sea**" and "**Exposed**" for the worst environmental conditions.

The data we must complete are:

- Conditions.
- Maximum wave height.
- Significant wave height.
- Maximum current speed.
- Maximum wind speed.

By clicking on the units of current speed and maximum wind speed we can change them and automatically convert them to another measurement system.



5. Buoy family

This section groups all the information related to the parameters of a buoy. You can select from several available MSM catalogs, you can even create new buoy families tailored to your needs.

You can also edit the current parameters of a buoy, as well as delete it or add new buoys to an existing family.

The screenshot shows the SIMCAD Buoy screen. On the left is a sidebar with the MSM logo and navigation links: File, Tools, Help, PROJECT, BUOY (selected), CHAIN, and SIMULATION. The main area contains several input fields for buoy parameters:

- Family:** SERIE-EBM-OC (dropdown), with buttons for "Create family" and "Delete family".
- Model:** EBM22OC-3SAS (dropdown).
- Recommended depth:** 25 - 200 m.
- Min. Max. counterweight:** 475 - 855 Kg.
- Chain diameter:** 28 - 46 mm.
- Max. chain load:** 1625 Kg.
- Float volume:** 5000 L.
- Diameter:** 2260 mm.
- Focal height:** 3600 mm.
- Mooring point depth:** 3.45 m.
- Counterweights:** 665 KG, 7 x 95 KG.
- Equipment:** 0 KG, with a "Define" button.

On the right, there are sections for "Area exposed to wind" and "Area exposed to current", each with input fields for cylindrical, flat, reticulated, spherical, and daymarks areas. Below these are input fields for "Center of buoyancy without chain", "Inertia of buoy respect CG", "Center of gravity of buoy", and "Waterline and Coordinate origin". A 3D model of a yellow buoy is shown on the right. At the bottom right, there are buttons for "Edit", "Add", and "Delete".

At the bottom of the screen is a table of existing buoy families:

Family	Model	Df	Hf	Pt	Da	Pcmx	Pcmn	PesoContr	UdContr	Ccad	Dcmx	Dcmn
EBM	EBM24TS-P	2400	3600	2300	8000	950	500	95	7	3300	46	28
EBM	EBM24OC-2SAS	2400	3600	2100	5800	855	475	95	7	2000	46	28
EBM	EBM24OC-P	2400	3200	2600	6200	297	49,5	16,5	15	1700	46	28
EBM	EBM22OC-3SAS	2260	3600	2050	5000	855	475	95	7	1625	46	28
EBM	EBM22OC-2SAS	2260	3600	2000	5000	855	475	95	7	1700	46	28
EBM	EBM20OC-SAS	2000	3500	1800	3800	760	380	95	6	1000	40	26

Version 3.5.0

Figure 7: Buoy screen

The first step is to select a family from among the many existing ones. A family groups a set of buoys with similar characteristics, within a family each buoy is identified by its model.

When we select a family, a list will be filled in with each and every one of the models that make up that family. When you click on any of the available rows, all the information available for that model will be filled in, so that you can see and modify each of the parameters that make up that specific model.

Once a model is selected, the options to choose the appropriate chain model will be enabled .

Once the row is selected you can edit the configuration parameters, these are shown in red to indicate that the default configuration of that buoy has been altered for the simulation.

- **Add button:** If the model is not in the database, it is used to add all the information of a buoy to the current family. If the model was already in the database to save the buoy information we are editing, we will be asked if we want to overwrite the data with the current configuration. At the end of the process, we can choose a significant image or on the contrary cancel and leave an image as a default.
- **Delete button:** Removes the selected buoy model from the current buoy family.

- **Create family button:** Create a new buoy family so you can introduce your own buoy models.
- **Delete family button:** Removes an entire family of buoys. Handle this option carefully as the data cannot be recovered.
- **Define button:** Allows you to modify the equipment of a buoy. Within this menu you will be able to choose from all the available equipment that comes predetermined by MSM, add additional ballast and create or remove equipment of your choice.

Define equipment

MCL

MCL100 (1,5 kg)	☐
MCL120 (1,6 kg)	☐
MCL360L (15,8 kg)	☐
MCL360M (9,2 kg)	☐
MCL360SP (8,3 kg)	☐
MCL360S (5,5 kg)	☐
MCL360XS (4 kg)	☐

MBL

MBL120 (1 kg)	☐
---------------	--------------------------

Additional ballast: kg. Accept

Total equipment ballast: 0 kg. Cancel

Create/Delete Equipment

Create new equipment in section:

Add

Delete Section/Equipment:

Delete.

Figure 8: Equipment

- **Consider daymark surface:** Sets the option of whether or not you want to take into account the surface of daytime marks in the simulation as this is an optional parameter on a buoy.

Note: For security reasons, MSM catalogs cannot be edited and therefore some disabled buttons will appear.



6. Chain family

The last step before performing a simulation is the choice of the right chain, the simulation will give us the viability of the selected chain, as well as the appropriate length for the buoy we have selected.

SIMCAD

MSM

File Tools Help

PROJECT

BUOY

CHAIN

SIMULATION

Version 3.5.0

Family: **U2-SIN CONCRETE** **Create family** **Delete family**

Weight per dry linear meter: **8.0** Kg.

Link diameter (d): **19.0** mm.

Link length (Le): **114** mm.

Link width (B): **68.4** mm.

Minimum Breaking Load (Tr): **187.2** KN.

Safe Working Load (Tt): **93.6** KN.

Quality chain (Gr): **U2**

Price per kilo: **0** €

Sinkers specification

MATERIAL: **CONCRETE 3 Kg/m3**

Add **Delete**

Family	d (mm.)	Le (mm.)	B (mm.)	Wm (kg.)	Gr	Tt (KN)	Tr (KN)
SIN CONCRETE	12.5	75	45.0	3.7	U2	41.2	82.6
SIN CONCRETE	14.0	84	50.4	4.0	U2	51.0	101.9
SIN CONCRETE	16.0	96	57.6	5.2	U2	66.2	132.3
SIN CONCRETE	18.0	108	64.8	6.5	U2	78.9	157.8
SIN CONCRETE	19.0	114	68.4	8.0	U2	93.6	187.2
SIN CONCRETE	20.0	120	72.0	8.2	U2	102.4	204.8
SIN CONCRETE	22.0	132	79.2	10.0	U2	125.4	250.9
SIN CONCRETE	24.0	144	86.4	12.5	U2	149.9	298.9
SIN CONCRETE	26.0	156	93.6	14.0	U2	175.4	350.8
SIN CONCRETE	28.0	168	100.8	16.5	U2	203.8	406.7
SIN CONCRETE	30.0	180	108.0	19.0	U2	234.2	467.5
SIN CONCRETE	32.0	192	115.2	21.5	U2	265.6	531.2
SIN CONCRETE	34.0	204	122.4	24.0	U2	299.0	599.8

Figure 9: Chain screen

As in the case of the buoy tab, we must choose between one of the available families of chains, when we display the selector, we will have a list of all the families that we can choose. When selecting the desired family, a list will be filled in with each of the available models, as well as their characteristics.

Fill in the Price per kilogram of chain field if you want to know the price associated with the meters of chain you will need.

The selected model can be edited before the simulation, but in this case the values will be highlighted in red to indicate that the original parameters have been modified.

- **Add button:** It allows you to add a new model to the current family, if there is a model with the same characteristics it allows you to confirm the edition.
- **Delete button:** Delete the current chain.
- **Create family button:** It allows you to create a new family of chains to group those models with similar characteristics. Once the name has been assigned, you must select a representative image or cancel and leave the image as the default.
- **Delete family button:** Allows you to delete a catalog of chains. Handle this option carefully as the data cannot be recovered.
- **Sinker:** Using the drop-down menu, you can choose between 3 types of sinker material.



7. Simulation

Once the project data has been completed, a buoy and a chain have been selected, the option to simulate will be available in the corresponding tab.

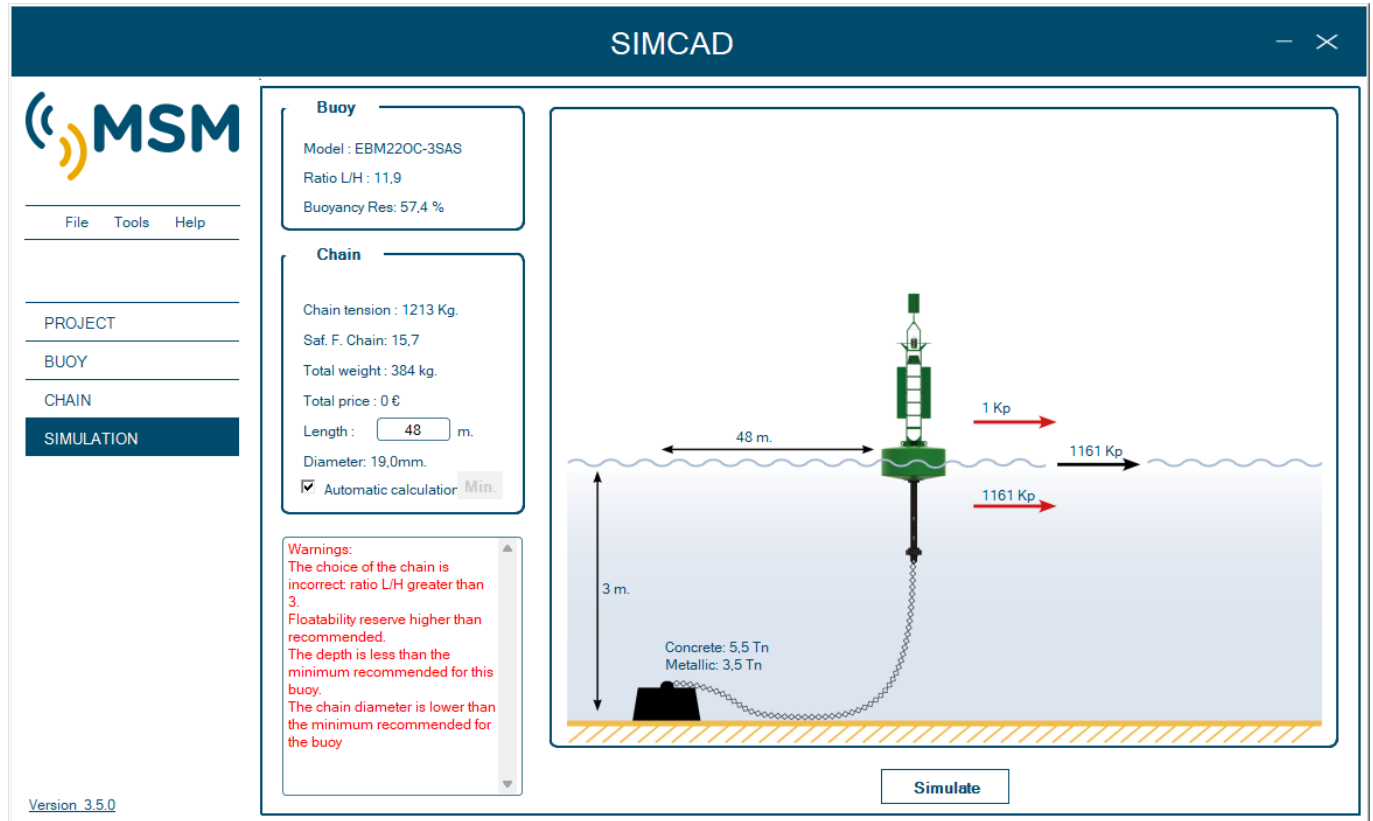


Figure 10: Simulation screen

On this screen we can see graphically the result of the simulation, as well as numerically the forces exerted on the buoy.

The **"Buoy"** grouping brings together the results obtained with the input data, in this section we can know:

- Ratio L/H.
- Buoyancy Res.

The **"Chain"** grouping shows the results that we are going to obtain using the selected configuration, among these parameters are:

- Chain tension. Maximum tension suffered by the chain.
- Chain safety ratio.
- Total weight of the chain.
- Total price of the chain.
- Chain length. Automatic calculation of the length we need of the selected chain, this length has already been discounted from the depth of the mooring.
- Diameter.
- Automatic calculation. It indicates whether or not we want to select the automatic calculation of the length, if not we must enter the desired number of meters to proceed with the simulation.
- "Min" button. In manual mode, calculate the minimum chain length that we will need.

Warnings. In this section, a series of warnings will be shown about the result obtained. Some are only informative and others warn of the unfeasibility of the set of buoy and chain selected.

The data shown in the image are:

- Maximum Swinging radius.
- Average Depth.
- Wind force.
- Current force.
- Total force.
- Concrete sinker.
- Metallic sinker.

As a final result, we can view a report with the data obtained for export in .pdf format.

It shows all the data obtained, as well as a representative image and all the warnings that may have occurred during the simulation.



Mediterráneo Señales Marítimas, S.L. / ☎ +34 96 276 10 22 / ✉ msm@mesemar.com / www.mesemar.com