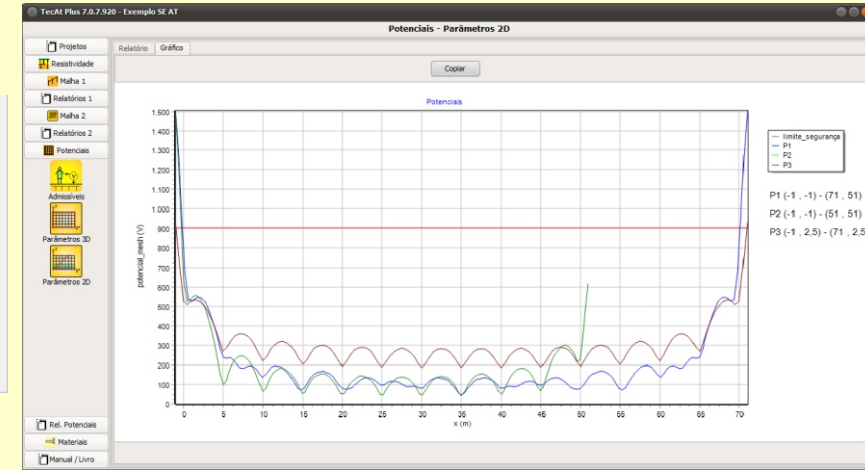
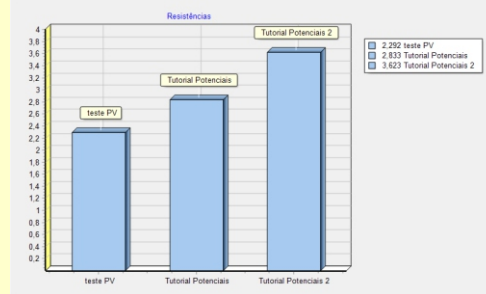
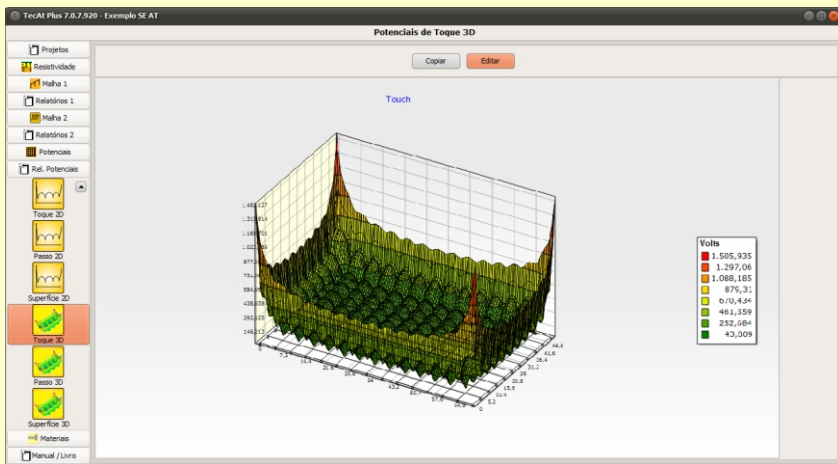


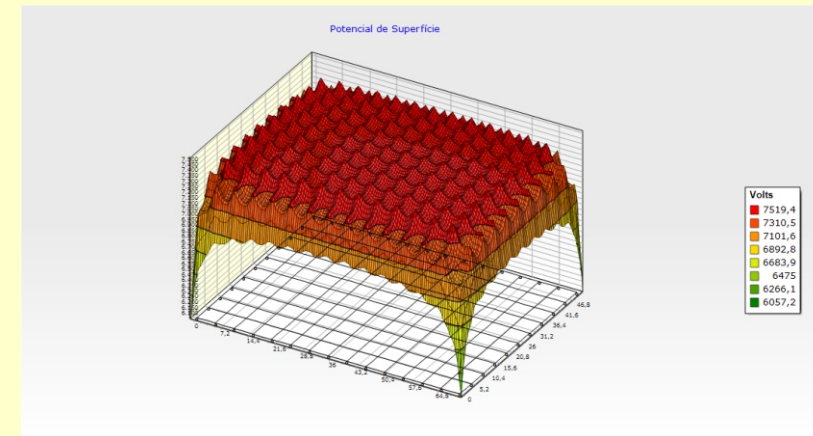
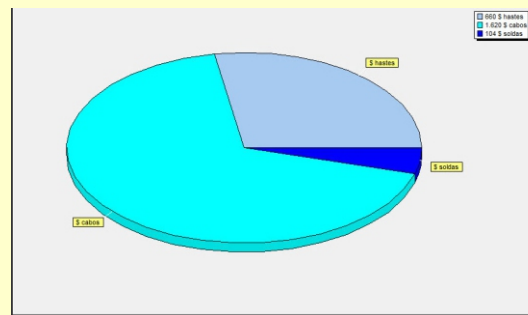
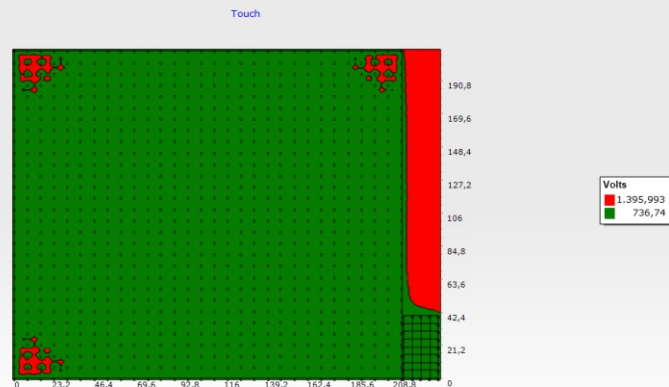
# TECAT PLUS 7.0

Software for Grounding Grid design

NEW! version 7.0 (January 2023):  
64-bit, multi-processor and with  
support for large PV plants!



With over 33 years of development, TecAt Plus is the best cost/benefit ratio on the world market for earth grids for any application, in soils with 2, 3 or 4 layers.  
Exceeding the requirements of major standards, TecAt Plus also gives you the analysis tools you need to find the optimal solution for your grounding needs.



# **TECAT** *PLUS* **7.0**

Software for Grounding Grid design

TecAt Plus - new on version 7.0:

- 64 bit code (needs Windows 64 bits), for dimensioning grids for those really big PV plants
- multiprocessing, using all your processor cores to accelerate calculations and graphics operations
- step and touch potentials also in 3 D
- map of safe and dangerous sections of the grid
- up to thousands of measuring lines for resistivity analysis
- new report editor VBRE
- new tutorials

# **TECAT *PLUS* 7.0**

Software for Grounding Grid design

TecAt Plus - the complete solution:

## SOIL RESISTIVITY

- Wenner or Schlumberger
- resistivity in 2, 3 or 4 layers

## MESH RESISTANCE

- 64-bit: calculate a large PV power plant
- complex grids of any size on multilayer soil
- import via CSV file of grids designed in CAD programs
- quick comparison of small grids in 2 layer soils

## HAZARDOUS POTENTIALS FOR SUBSTATIONS AND PV grids

- touch, step and surface potentials in 3-D view
- touch, step and surface potentials in 2-D view

## DESCRIPTIVE REPORTS, GRAPHICS AND TABLES

- export, print or copy to another program
- bill of materials, cost of materials and labor and deadline

## ANALYSIS BY COMPARATIVE CHARTS BETWEEN SEVERAL GRIDS

## INCLUDES THE DIGITAL EDITION OF THE BOOK 'Malhas de Terra'

# TECAT PLUS 7.0

Software for Grounding Grid design

Resistivity - now with thousands of measurement lines!

TecAt Plus 7.0.7.920 - usina 5 MWp

**Resistividade - Medições**

Fórmula: completa ☐ eliminar se > 0 % fora da média  
Modelo: Wenner Profundidade (h) 0,25 m  
espaçamento m Dados em: Resistência  $\Omega$  [Nova] [Editar] [Deletar] [Atualizar]

espaçamento	2	4	8	16	32	0	0	0	0	0	0	0	0	0	0	0
m 1	50	22	8	3	1,1	0	0	0	0	0	0	0	0	0	0	0
m 2	47	23	7	2,5	0,9	0	0	0	0	0	0	0	0	0	0	0
m 3	53	21	7,4	2,2	1	0	0	0	0	0	0	0	0	0	0	0
m 4	42	18	9	4	1,8	0	0	0	0	0	0	0	0	0	0	0
m 5	45	20	8	3,3	1,2	0	0	0	0	0	0	0	0	0	0	0
m 6	48	14	5	2,3	1,1	0	0	0	0	0	0	0	0	0	0	0
m 7	51	17	6	2	0,5	0	0	0	0	0	0	0	0	0	0	0
m 8	49	21	7	2,5	0,9	0	0	0	0	0	0	0	0	0	0	0

[Atualizar] [Validar]

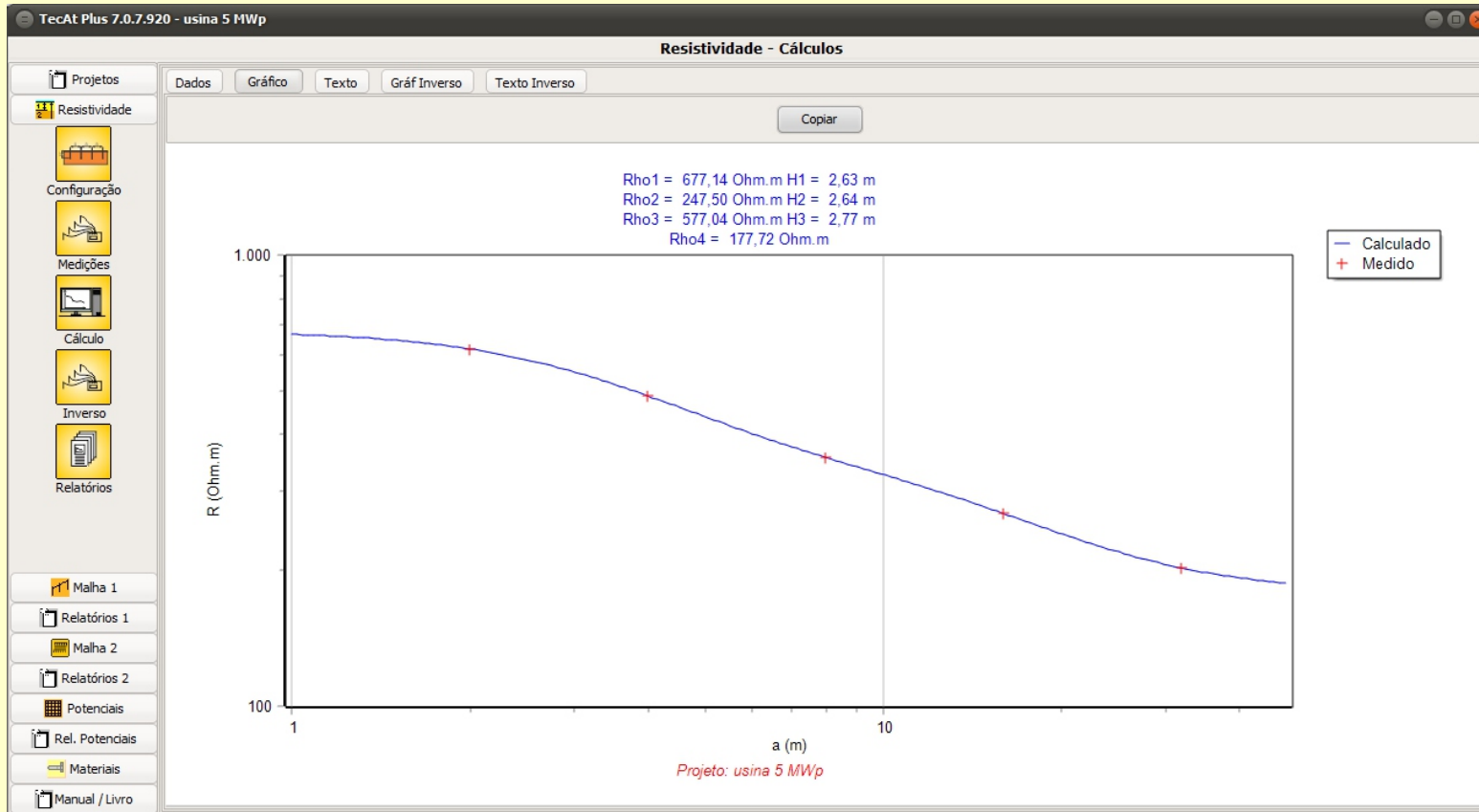
espaçamento	2	4	8	16	32	0	0	0	0	0	0	0	0	0	0	0
mínima	42	14	5	2	0,5											
máxima	53	23	9	4	1,8											
aritmética	48,12	19,5	7,18	2,72	1,06	0	0	0	0	0	0	0	0	0	0	0
geométrica	48,01	19,28	7,07	2,66	1,01	0	0	0	0	0	0	0	0	0	0	0
resistência	48,01	19,28	7,07	2,66	1,01											
resistividade	619,44	487,94	356,15	267,5	202,52	0	0	0	0	0	0	0	0	0	0	0

Using up to 32,000 measurement axes (lines) and up to 16 spacings, TecAt Plus stratifies soil resistivity into 2, 3 or 4 layers, numerically, without the errors of manual and graphical methods; you can even check the error of a stratification performed manually or by other software!

# TECAT PLUS 7.0

Software for Grounding Grid design

## Resistivity - chart report

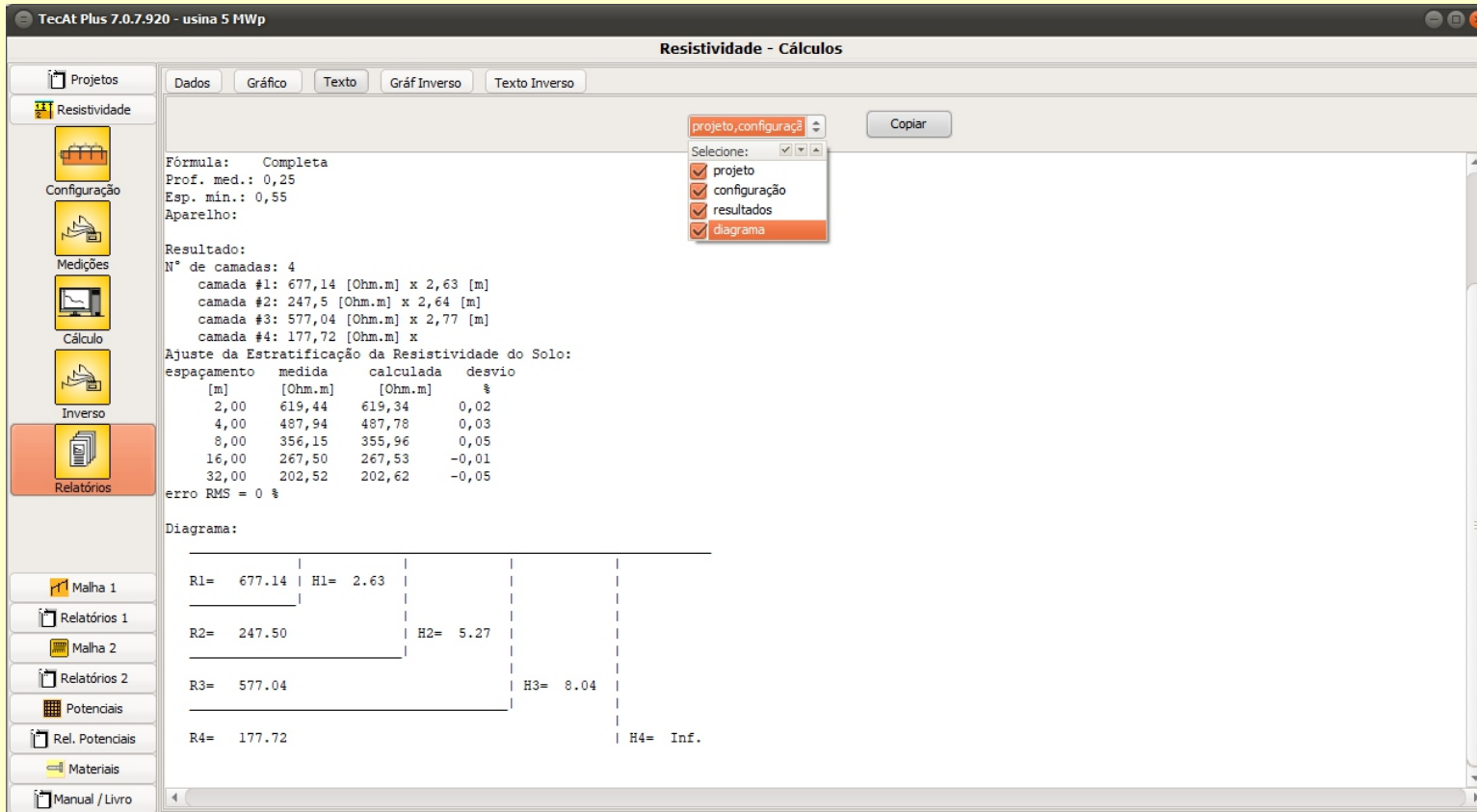


The stratification is presented both in numerical format and in a log-log graph, where it is possible to visualize the field data and the curve found.

# TECAT PLUS 7.0

Software for Grounding Grid design

## Resistivity - text report



TecAt Plus 7.0.7.920 - usina 5 MWp

Resistividade - Cálculos

Dados Gráfico Texto Gráf Inverso Texto Inverso

projeto, configuração

Copiar

Fórmula: Completa  
Prof. med.: 0,25  
Esp. min.: 0,55  
Aparelho:

Resultado:  
N° de camadas: 4  
camada #1: 677,14 [Ohm.m] x 2,63 [m]  
camada #2: 247,5 [Ohm.m] x 2,64 [m]  
camada #3: 577,04 [Ohm.m] x 2,77 [m]  
camada #4: 177,72 [Ohm.m] x

Ajuste da Estratificação da Resistividade do Solo:

espaçamento	medida	calculada	desvio
[m]	[Ohm.m]	[Ohm.m]	%
2,00	619,44	619,34	0,02
4,00	487,94	487,78	0,03
8,00	356,15	355,96	0,05
16,00	267,50	267,53	-0,01
32,00	202,52	202,62	-0,05

erro RMS = 0 %

Diagrama:

R1= 677.14	H1= 2.63		
R2= 247.50	H2= 5.27		
R3= 577.04	H3= 8.04		
R4= 177.72	H4= Inf.		

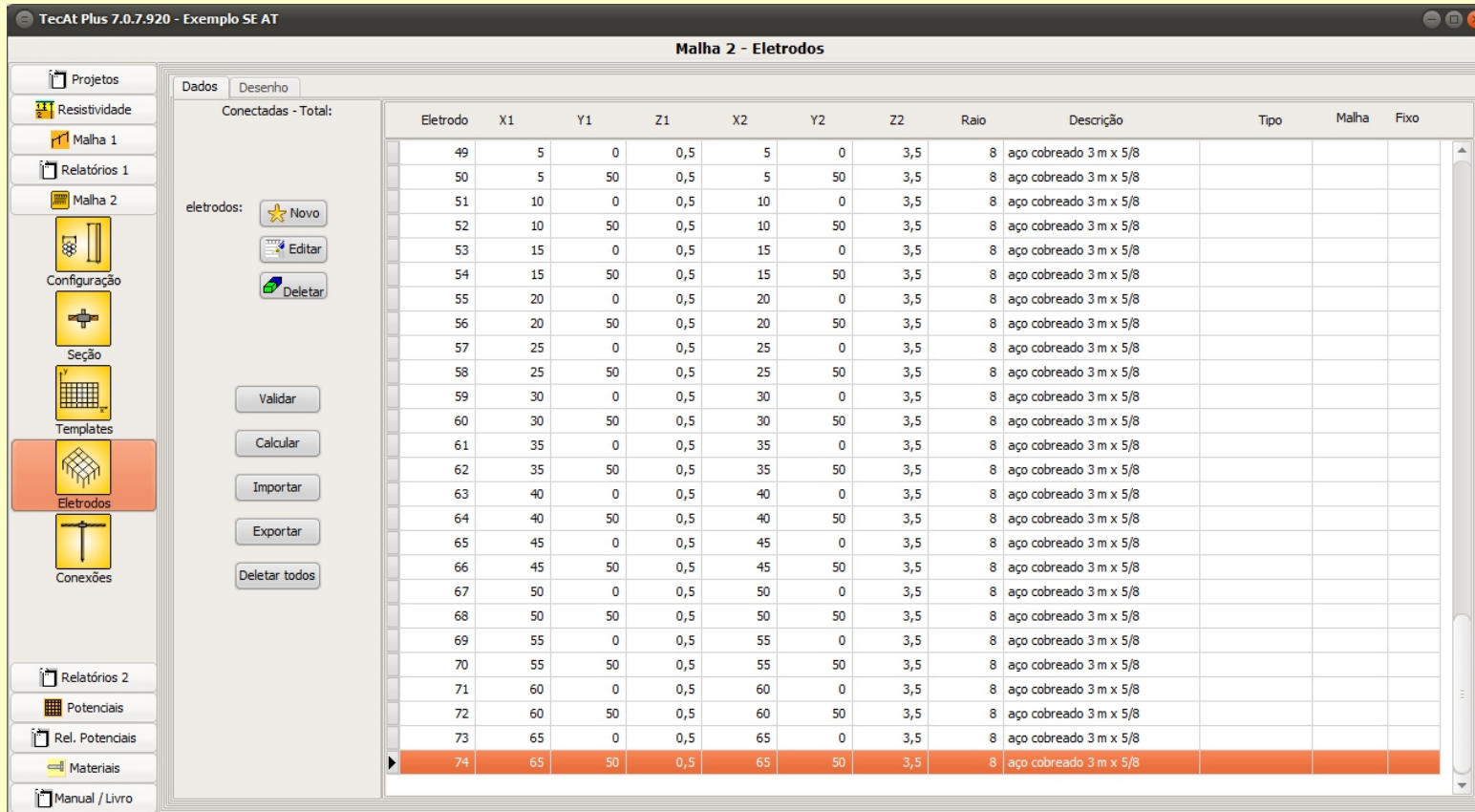
Select the data you want to include in the report, including the deviations of each point and the set of measurements, thus providing full assurance of the accuracy obtained in the fit between the field data and the calculated curve.



# TECAT PLUS 7.0

Software for Grounding Grid design

## Grid 2 Module: big / complex grids

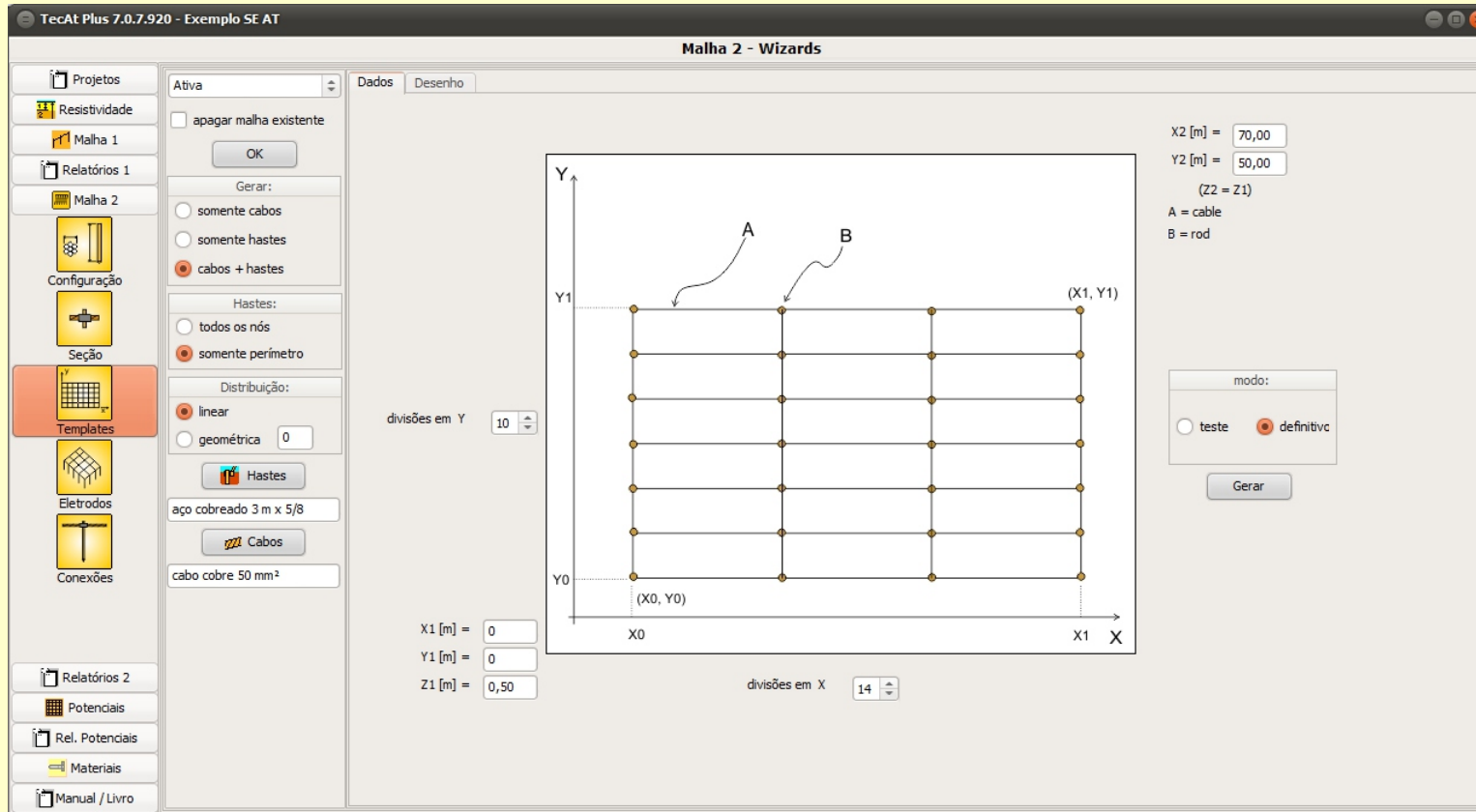


In the Mesh 2 module, for complex grids like substations and PV plants, you can enter each electrode individually or use the templates ('wizards') for automatic generation (see below) or import existing grids from a CAD program using a CSV file easy to generate!

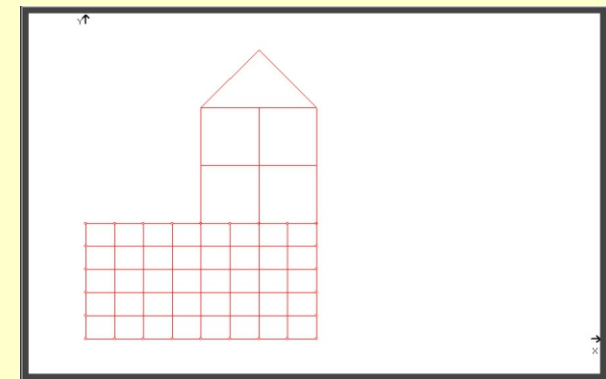
# TECAT PLUS 7.0

Software for Grounding Grid design

## Grid 2 - Templates



With TecAt's templates, you can automatically generate each regular portion of the mesh; there are wizards for rectangles, lines, circles (polygons) and triangles, and the rectangular can be divided into equal or progressive distances between cables (and rods). You can build complex grids quickly!

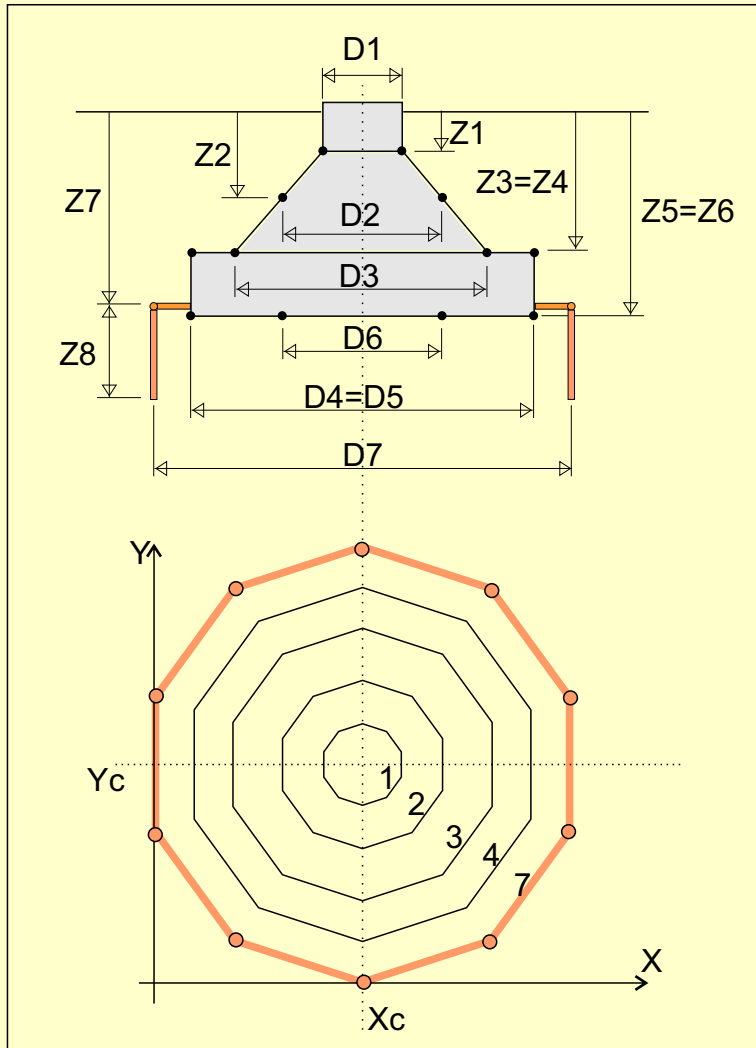




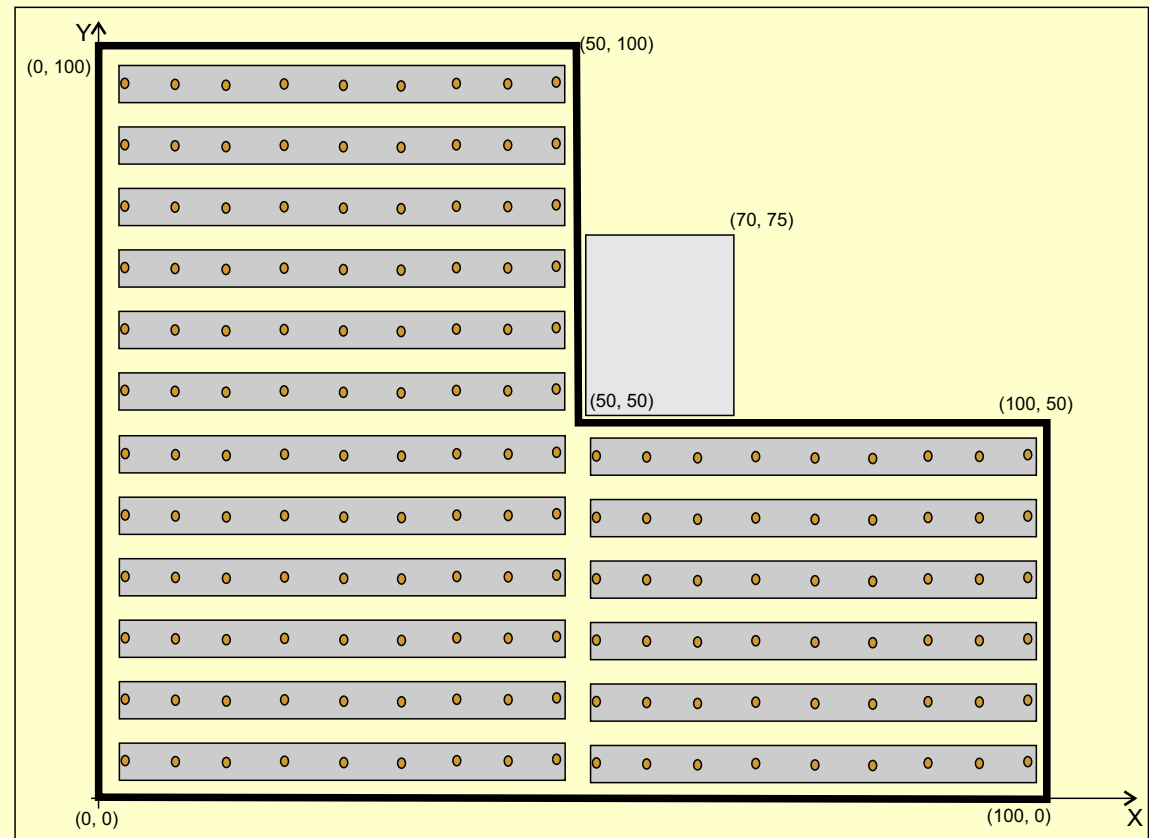
# TECAT PLUS 7.0

Software for Grounding Grid design

New Templates (since v. 6.5): Polygon, Wind Turbine and PV plant



The new Templates help build grids for these new applications:



# TECAT PLUS 7.0

Software for Grounding Grid design

## Resistance Report

TecAt Plus 7.0.7.920 - Exemplo SE AT

**Malha 2 - Resistência**

Resistência da malha [Ohm]: 1,89 Corrente de falta [kA]: 4 Máximo potencial da malha [V]: 7563,18 Copiar

Dados do Projeto:  
Projeto: Exemplo SE AT  
Cliente:  
Data: 25/12/2022  
Local:

N° de camadas: 3  
camada #1: 100 [Ohm.m] x 1 [m]  
camada #2: 200 [Ohm.m] x 2 [m]  
camada #3: 300 [Ohm.m] x

Resistência da Malha [Ohm] = 1,89  
Máximo potencial da Malha [V] = 7563,18

individual\_data

Nr.	X1 (m)	Y1 (m)	Z1 (m)	X2 (m)	Y2 (m)	Z2 (m)	Raio (mm)	NSub	Tipo
cabos									
0	0,0	0,0	0,5	70,0	0,0	0,5	4,0	15	A
1	0,0	5,0	0,5	70,0	5,0	0,5	4,0	15	A
2	0,0	10,0	0,5	70,0	10,0	0,5	4,0	15	A
3	0,0	15,0	0,5	70,0	15,0	0,5	4,0	15	A
4	0,0	20,0	0,5	70,0	20,0	0,5	4,0	15	A
5	0,0	25,0	0,5	70,0	25,0	0,5	4,0	15	A
6	0,0	30,0	0,5	70,0	30,0	0,5	4,0	15	A
7	0,0	35,0	0,5	70,0	35,0	0,5	4,0	15	A
8	0,0	40,0	0,5	70,0	40,0	0,5	4,0	15	A
9	0,0	45,0	0,5	70,0	45,0	0,5	4,0	15	A
10	0,0	50,0	0,5	70,0	50,0	0,5	4,0	15	A
11	0,0	0,0	0,5	0,0	50,0	0,5	4,0	11	A
12	5,0	0,0	0,5	5,0	50,0	0,5	4,0	11	A
13	10,0	0,0	0,5	10,0	50,0	0,5	4,0	11	A
14	15,0	0,0	0,5	15,0	50,0	0,5	4,0	11	A
15	20,0	0,0	0,5	20,0	50,0	0,5	4,0	11	A
16	25,0	0,0	0,5	25,0	50,0	0,5	4,0	11	A
17	30,0	0,0	0,5	30,0	50,0	0,5	4,0	11	A
18	35,0	0,0	0,5	35,0	50,0	0,5	4,0	11	A
19	40,0	0,0	0,5	40,0	50,0	0,5	4,0	11	A

Descriptive report with  
calculated resistance and  
listing of electrodes

# TECAT PLUS 7.0

Software for Grounding Grid design

## Connections Report

TecAt Plus 7.0.7.920 - Exemplo SE AT

Malha 2 - Conexões

Conexão	X	Y	Z	Cond 1	Cond 2	Dim 1	Dim 2	Forma	Tipo	Descrição
n°	[m]			n°		[mm] ou [mm²]		obs:	obs:	material
1	0	0	0,5	1	12	8	0	4	1	molde solda CC 50x50 mm²
2	5	0	0,5	1	13	8	0	1	1	molde solda T 50x50 mm²
3	10	0	0,5	1	14	8	0	1	1	molde solda T 50x50 mm²
4	15	0	0,5	1	15	8	0	1	1	molde solda T 50x50 mm²
5	20	0	0,5	1	16	8	0	1	1	molde solda T 50x50 mm²
6	25	0	0,5	1	17	8	0	1	1	molde solda T 50x50 mm²
7	30	0	0,5	1	18	8	0	1	1	molde solda T 50x50 mm²
8	35	0	0,5	1	19	8	0	1	1	molde solda T 50x50 mm²
9	40	0	0,5	1	20	8	0	1	1	molde solda T 50x50 mm²
10	45	0	0,5	1	21	8	0	1	1	molde solda T 50x50 mm²
11	50	0	0,5	1	22	8	0	1	1	molde solda T 50x50 mm²
12	55	0	0,5	1	23	8	0	1	1	molde solda T 50x50 mm²
13	60	0	0,5	1	24	8	0	1	1	molde solda T 50x50 mm²
14	65	0	0,5	1	25	8	0	1	1	molde solda T 50x50 mm²
15	70	0	0,5	1	26	8	0	4	1	molde solda CC 50x50 mm²
16	70	0	0,5	1	28	8	0	2	1	molde solda CH 50 mm² x 5/
17	5	0	0,5	1	49	8	0	2	1	molde solda CH 50 mm² x 5/
18	10	0	0,5	1	51	8	0	2	1	molde solda CH 50 mm² x 5/
19	15	0	0,5	1	53	8	0	2	1	molde solda CH 50 mm² x 5/
20	20	0	0,5	1	55	8	0	2	1	molde solda CH 50 mm² x 5/
21	25	0	0,5	1	57	8	0	2	1	molde solda CH 50 mm² x 5/
22	30	0	0,5	1	59	8	0	2	1	molde solda CH 50 mm² x 5/
23	35	0	0,5	1	61	8	0	2	1	molde solda CH 50 mm² x 5/
24	40	0	0,5	1	63	8	0	2	1	molde solda CH 50 mm² x 5/
25	45	0	0,5	1	65	8	0	2	1	molde solda CH 50 mm² x 5/

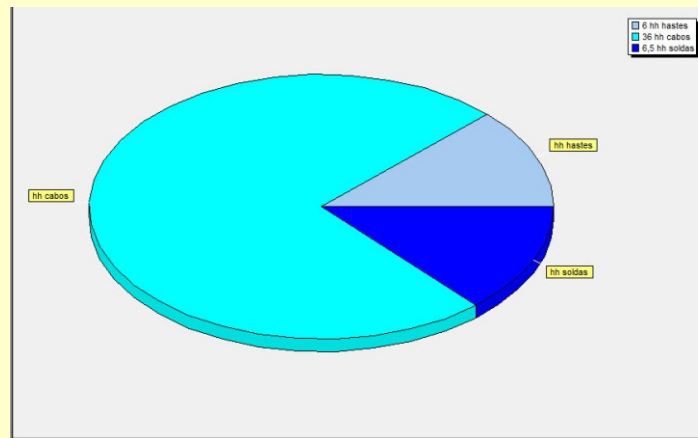
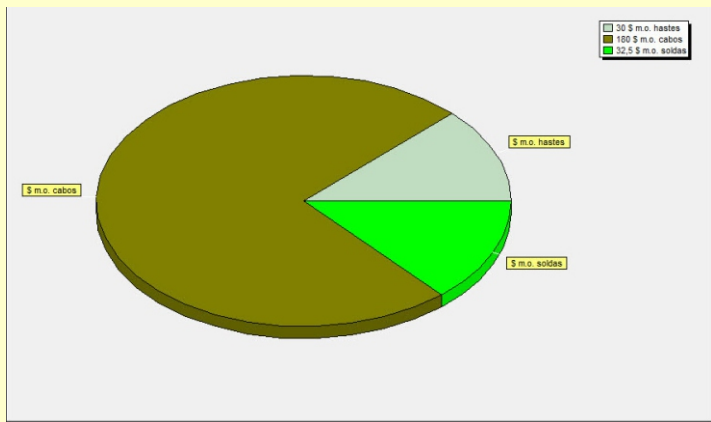
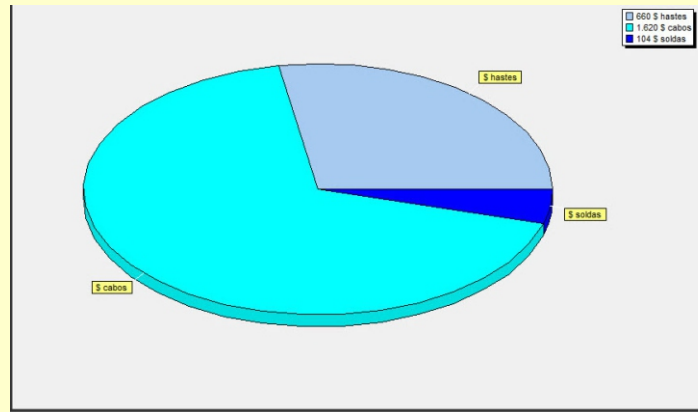
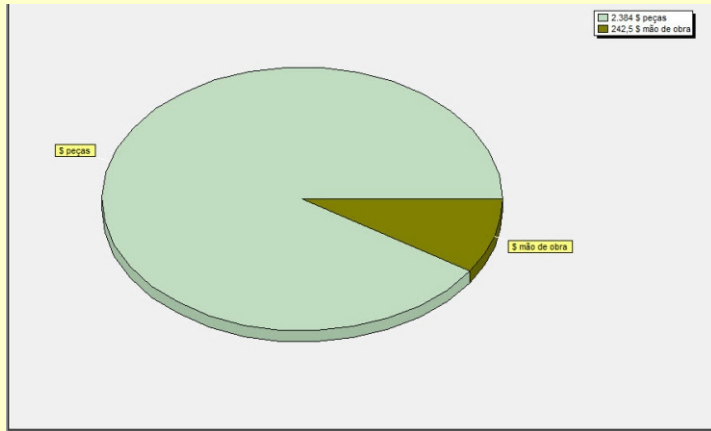
CSV  
XLS

TecAt automatically locates all electrode joints in the grid and, using components selected from the material database, builds the complete list of connections.

# TECAT PLUS 7.0

Software for Grounding Grid design

## Cost and Time Analysis

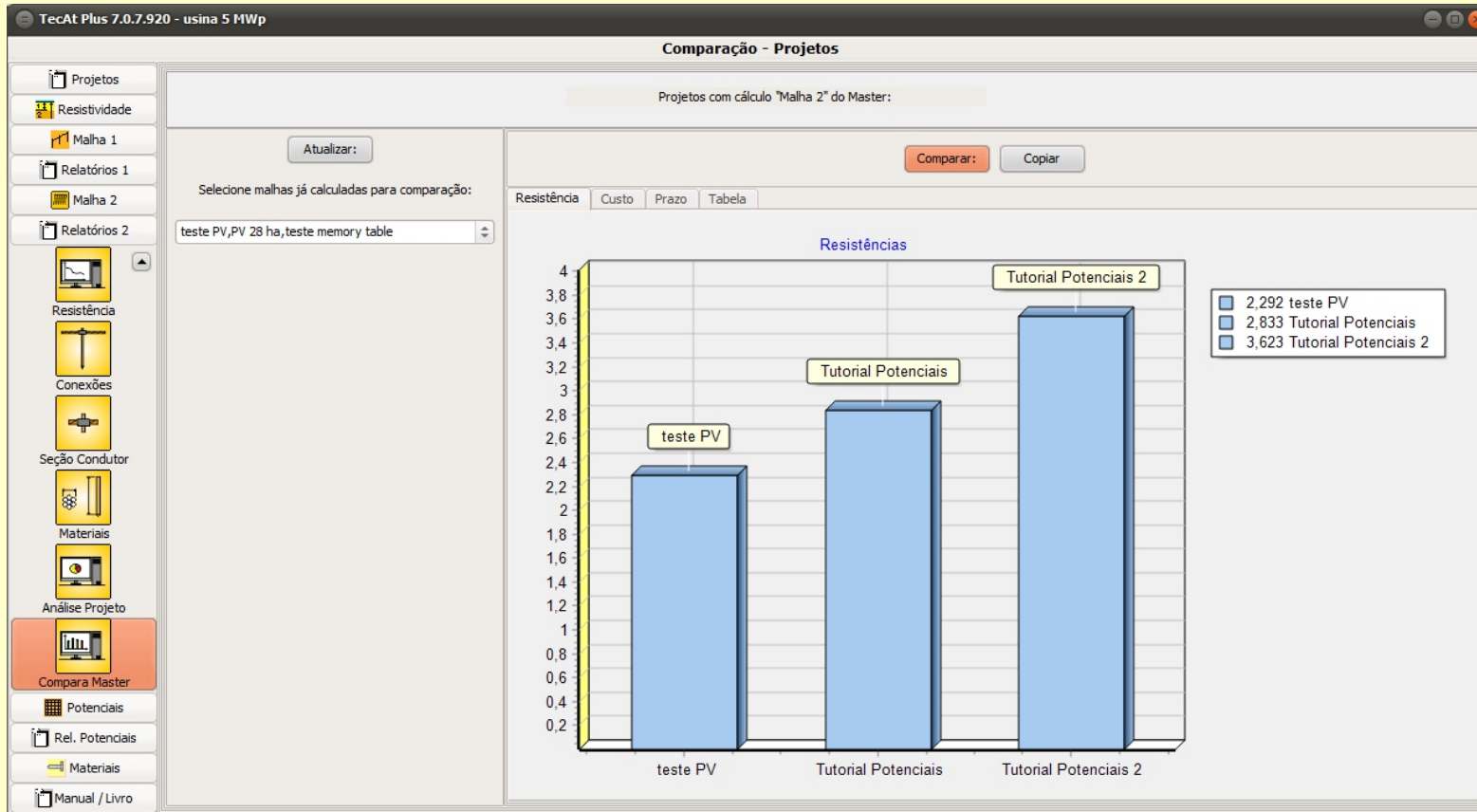


Within each mesh, you can compare material and labor costs, as well as the relative expense of cables, rods, and fittings, as well as the timelines to build the mesh.

# TECAT PLUS 7.0

Software for Grounding Grid design

## Grids compare

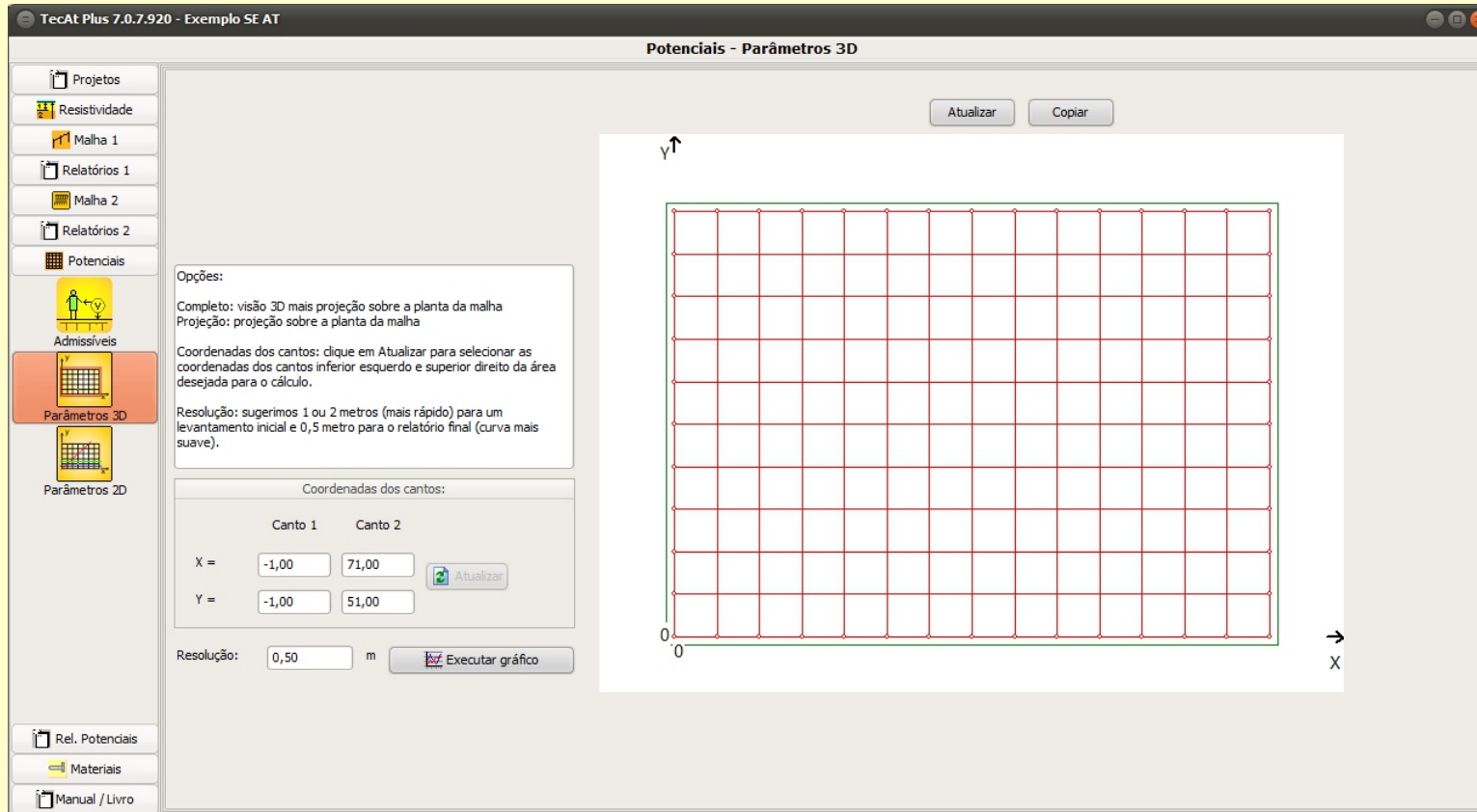


You can group several meshes in the same 'Master' file and, after calculating each one, compare the results of resistance, cost and time to build.

# TECAT PLUS 7.0

Software for Grounding Grid design

## Potentials Module: definition of the area



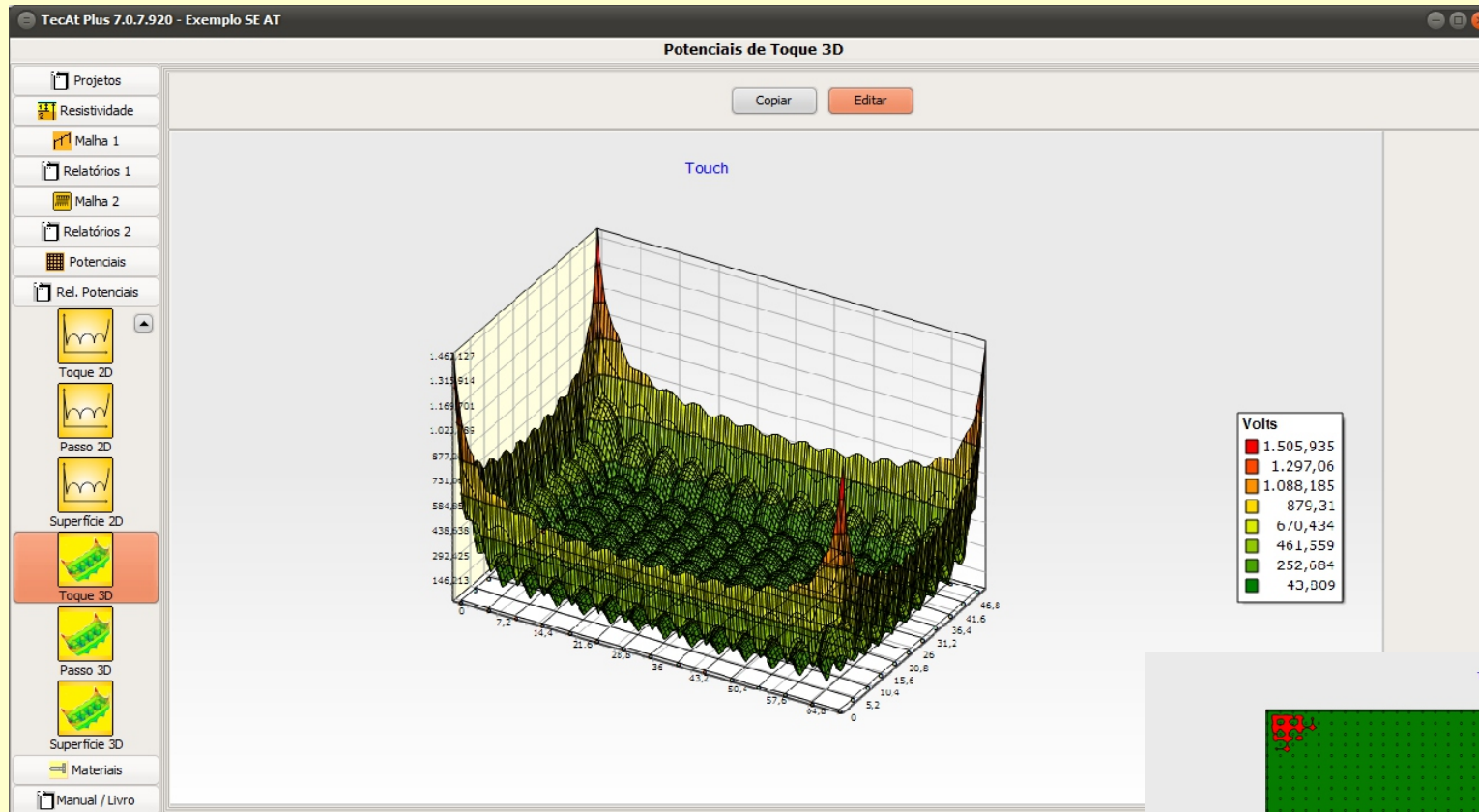
To get the 3D view of touch, step and surface potentials, you can define the desired area - the full mesh, part of it or include the outer area;



# TECAT PLUS 7.0

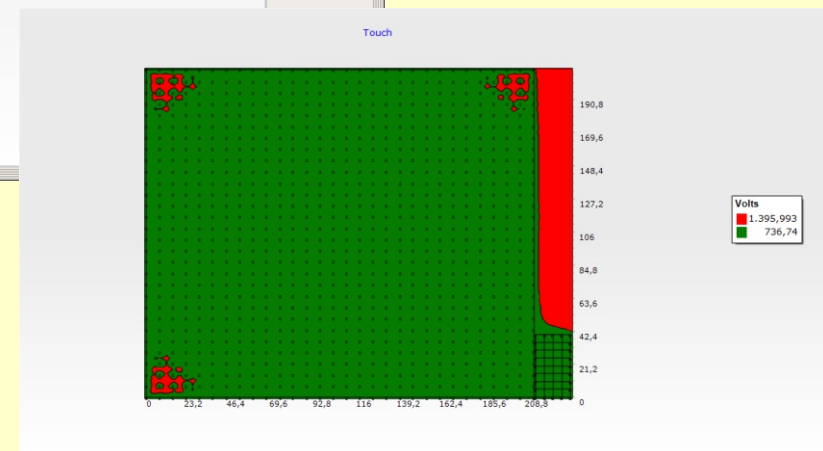
Software for Grounding Grid design

## Potentials Module: 3-D view



You can also lower the graph resolution for better speed and, after defining the mesh, increase it again for better appearance.

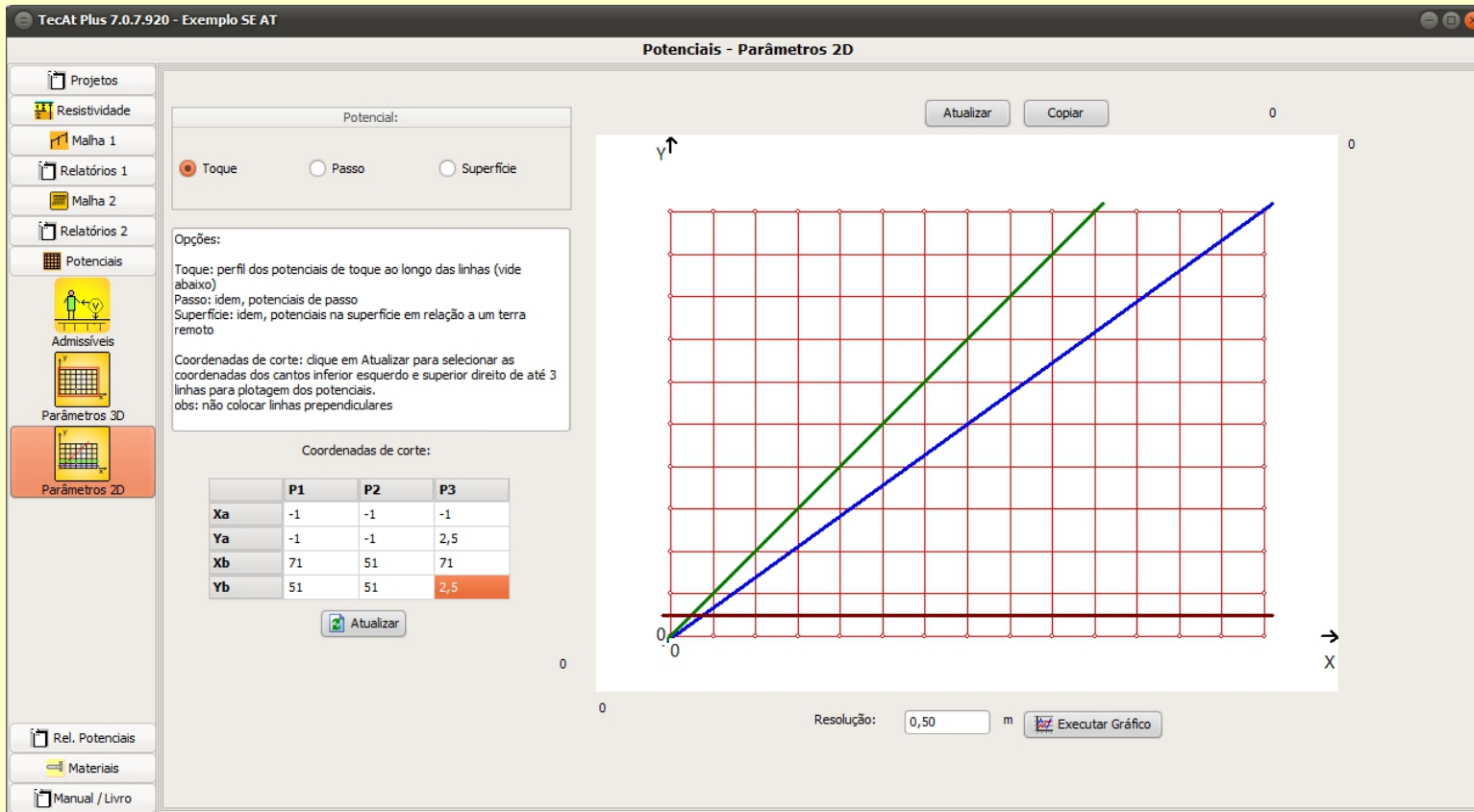
NEW! map of dangerous grid areas!! - >>



# TECAT PLUS 7.0

Software for Grounding Grid design

## Potentials Module: 2-D view

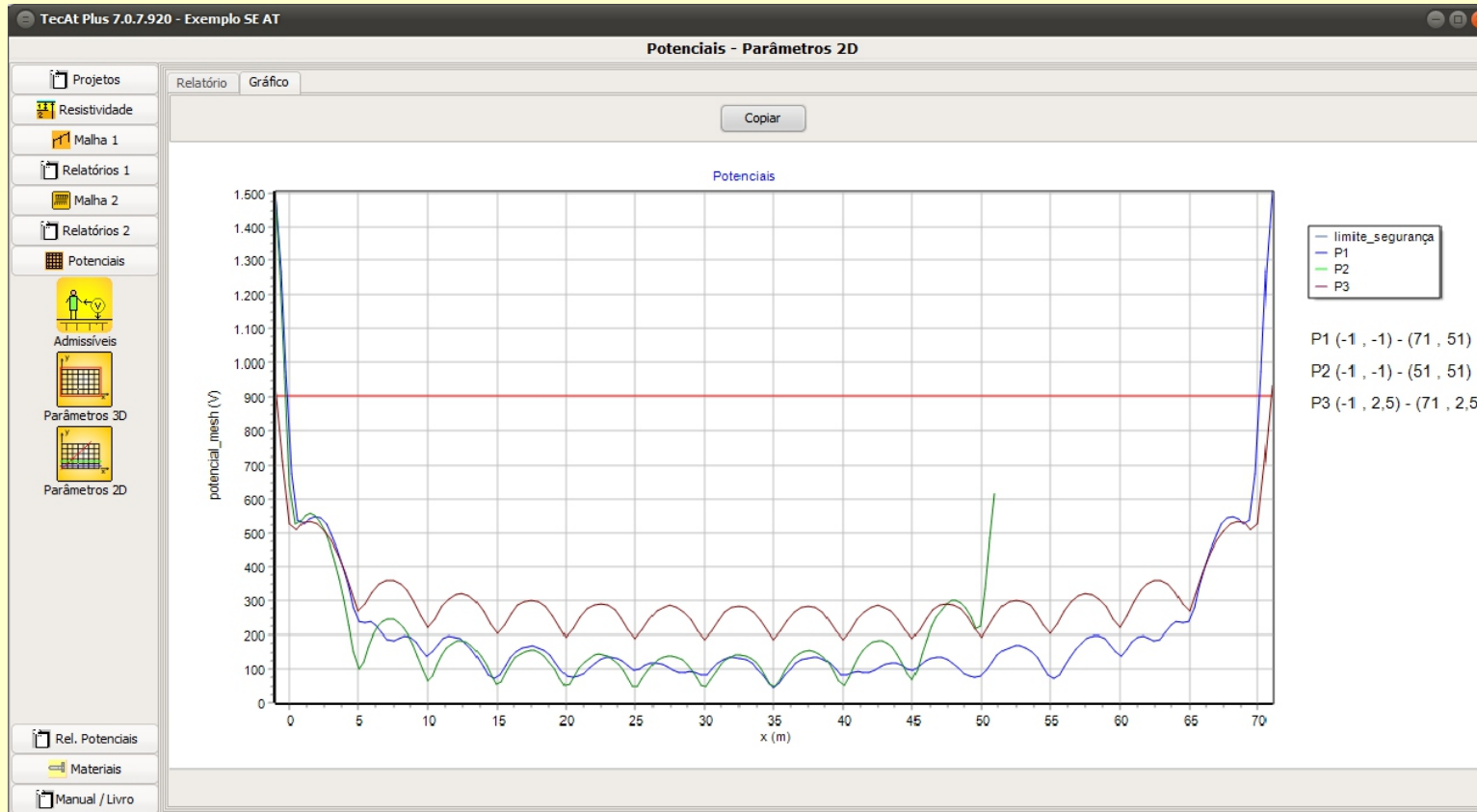


To visualize touch, step, and surface potentials in 2 dimensions, you can define up to 3 lines at a time, including coordinates outside the mesh area; as in the 3-D view, you can set the resolution of the graph

# TECAT PLUS 7.0

Software for Grounding Grid design

## Potentials Module: 2-D view

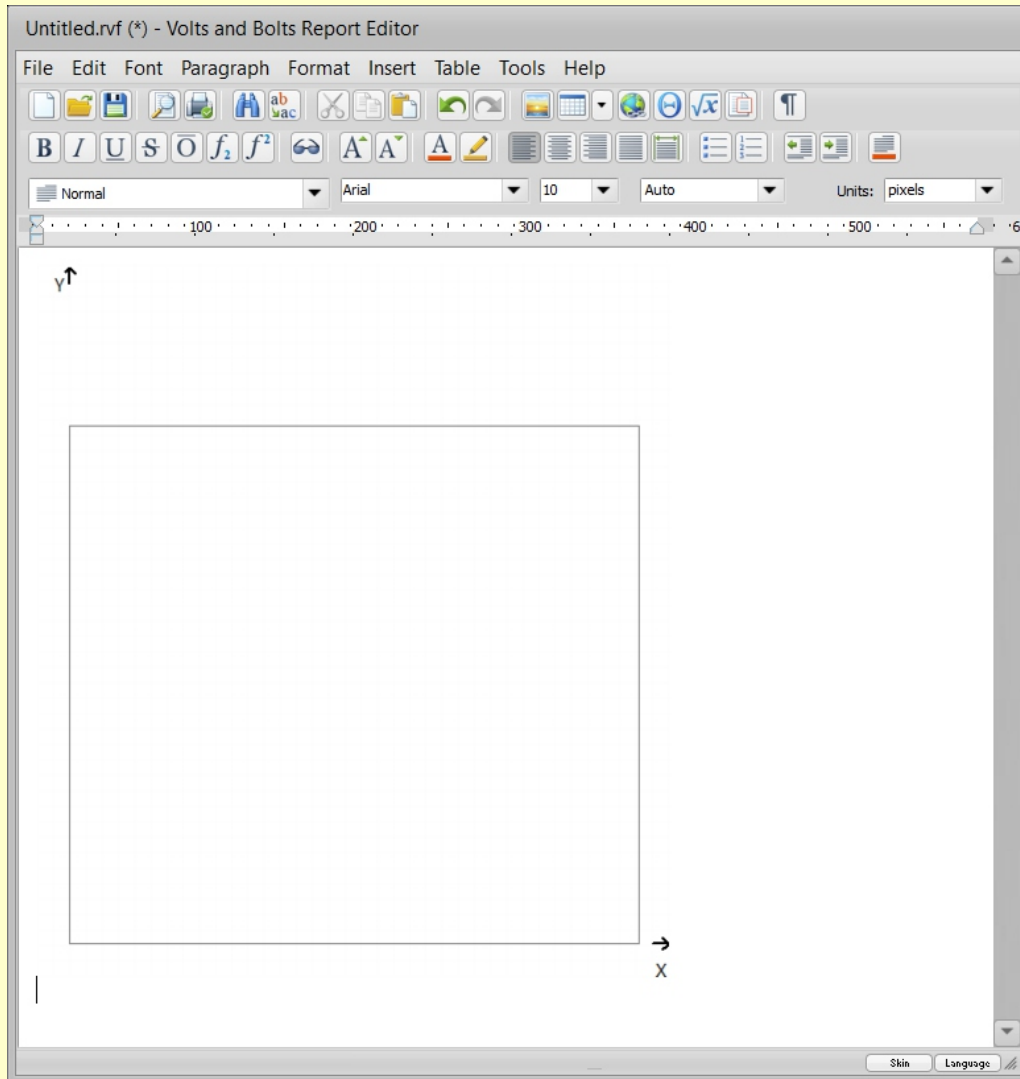


In the 2-dimensional view of touch, step and surface potentials, the potentials are plotted along the defined lines, together with the allowable potential (calculated separately, see below); for surface potentials, the red line represents the GPR (maximum grid voltage)

# TECAT *PLUS* 7.0

Software for Grounding Grid design

## VBRE - new Report Editor



TecAt now has a word processor so you can paste the various reports (and not lose any intermediate results); **Volts and Bolts Report Editor** takes up very little memory and is compatible with MS Word and can print to PDF using this Windows function.

# TECAT PLUS 7.0

Software for Grounding Grid design

## Auxiliary Calculations

**TecAt Plus 7.0.7.920 - Exemplo SE AT**

**Malha 2 - Planta**

Material:

Cálculo térmico da seção mínima dos condutores na conexão entre o cabo de descida da corrente de curto e o condutor da malha.  
Selecione um dos padrões da norma ou entre os dados se preferir.  
nota: entre a corrente e a duração do curto na tela "Malha 2 / Configuração"

padrões: cobre mole, solda  
cobre mole, solda  
cobre meio-duro  
meio-duro, sem recozer  
aço-cobre 40%  
aço-cobre 30%  
aço cobreado 254  
aluminio  
aluminio 5005

T máx. 0,0039  
T amb. 1,7200  
T ref. 0,0941 [cal / g / °C]  
 $\alpha$  0 8,9000 [g / cm³]  
 $\alpha$  20  
 $\rho$  20  
c  
densidade  
☒ usar TCAP  
TCAP 3,42

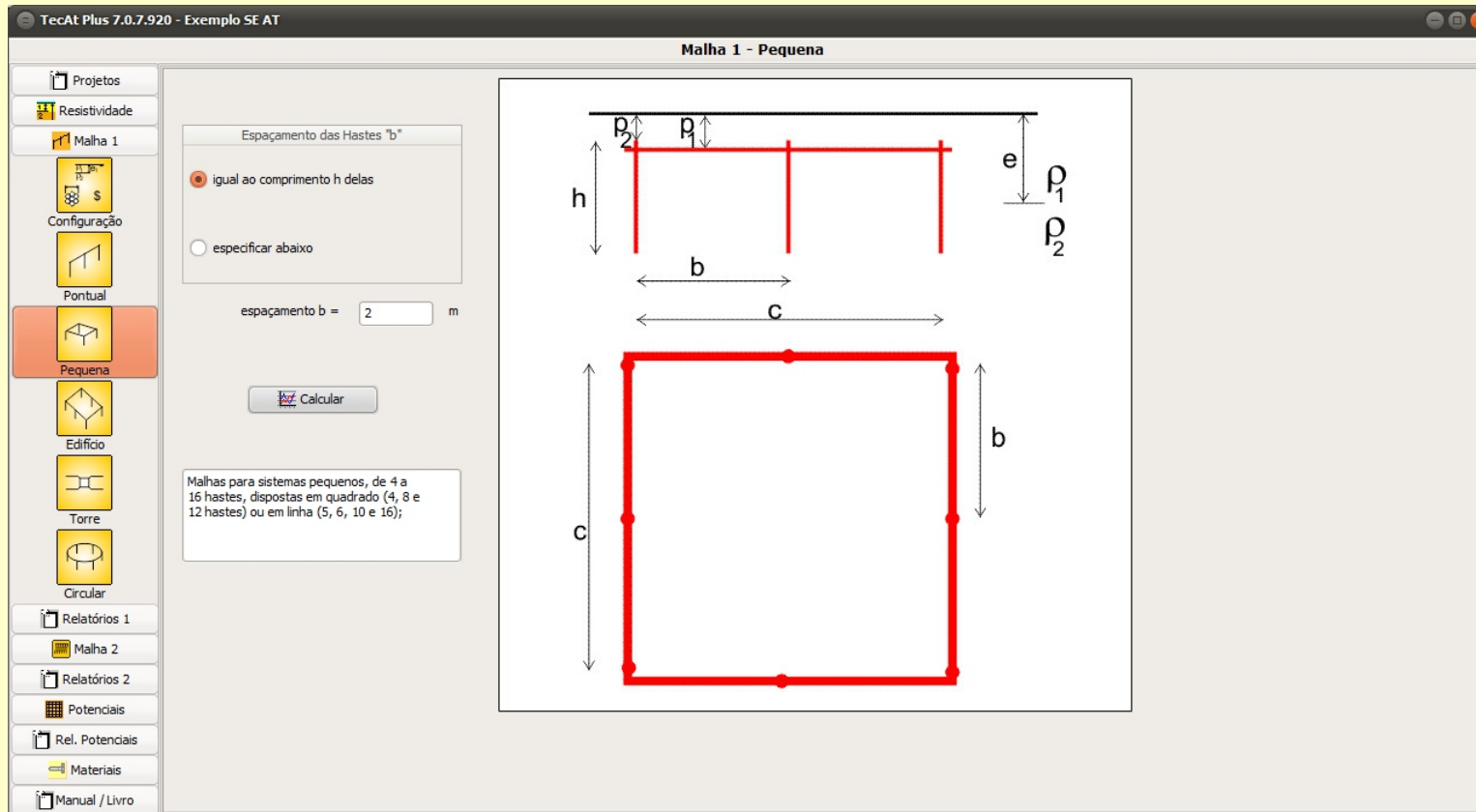
Calcular

TecAt also calculates the conductor section and the admissible potentials; for the conductor section, all materials from the standard are registered, or you can enter your own values; for the admissible touch and step potentials, TecAt uses the formulations of the IEEE/NBR and/or IEC standards (mesh current and short-circuit duration are required)

# TECAT PLUS 7.0

Software for Grounding Grid design

## Grid 1 Module: quick comparison of meshes



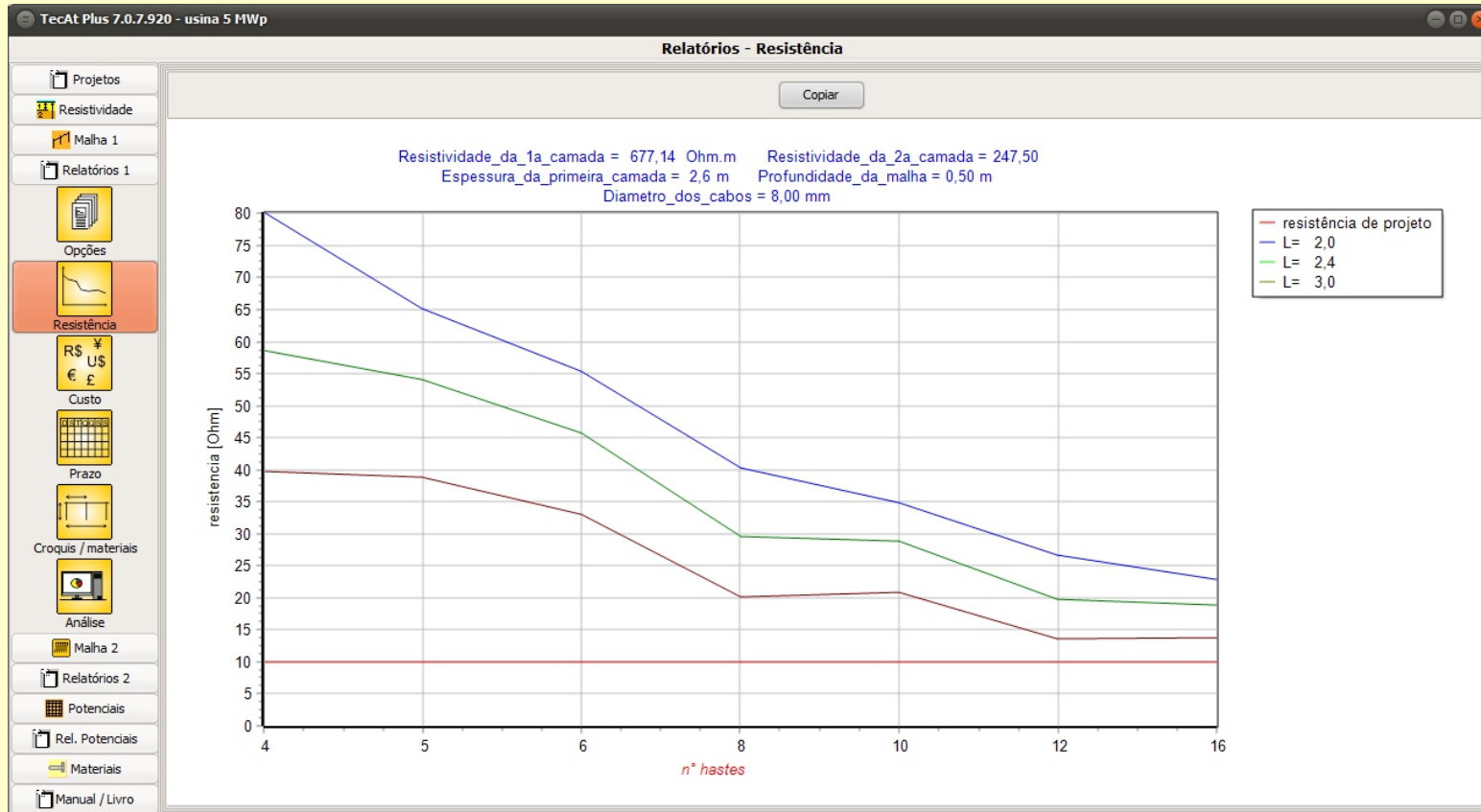
In addition to the calculation of complex meshes in multi-layer soils in the Mesh 2 module, in the Mesh 1 module we have a quick comparative calculation of pre-configured meshes, in two-layer soil, such as rectangular or circular rings (polygon) with up to 16 rods, with 3 rod lengths.



# TECAT PLUS 7.0

Software for Grounding Grid design

## Grid 1 Module: quick comparison of meshes



In the Mesh 1 module, TecAt instantly calculates 21 meshes with the same configuration but different sizes. presenting comparative graphs of resistance, cost and time of the work; after selecting the desired mesh, descriptive reports (with draft) and materials are generated.

# TECAT PLUS 7.0

Software for Grounding Grid design

## Materials Database

TecAt Plus 7.0.7.920 - Exemplo SE AT

Materials - Arquivo

Ordenar: Descrição | Procurar: | Foto ou croquis:

Novo | Copia p/novo | Editar | Deletar | Data-Sheet

Descrição	Grupo	Dimensões	Característica 01
aço cobreado 2.4 m x 5/8	Hastes	2.4 m x 5/8	
aço cobreado 3 m x 5/8	Hastes	3 m x 5/8	aço
cabo cobre 50 mm <sup>2</sup>	Cabos	50 mm <sup>2</sup>	
molde solda X 50x50 mm <sup>2</sup>	Soldas	50x50 mm <sup>2</sup>	
molde solda T 50x50 mm <sup>2</sup>	Soldas	50x50 mm <sup>2</sup>	
molde solda CC 50x50 mm <sup>2</sup>	Soldas	50x50 mm <sup>2</sup>	
molde solda CH 50 mm <sup>2</sup> x 5/8	Soldas	50 mm <sup>2</sup> x 5/8	
molde solda HH 5/8 x 5/8	Soldas	5/8 x 5/8	
Luva roscada 5/8	Luvas	5/8 x 5/8	
Compressão C 50 mm <sup>2</sup>	Conectores	50 x 50 mm <sup>2</sup>	
Compressão duplo G 50 mm <sup>2</sup>	Conectores	50 x 50 mm <sup>2</sup>	
Compressão G 50 mm <sup>2</sup> x 5/8	Conectores	50 mm <sup>2</sup> x 5/8	
Brita	Brita	#3	
aço cobreado 2.0 m x 3/4"	Hastes	2 m x 3/4	aço cobreado
aço cobreado 3 m x 3/4	Hastes	3 m x 3/4	aço cobreado
aço cobreado 2.4 m x 3/4	Hastes	2.4 m x 3/4	aço cobreado
cabo cobre 70 mm <sup>2</sup>	Cabos	70 mm <sup>2</sup>	cobre eletrolítico
Compressão C 70 mm <sup>2</sup>	Conectores	70 x 70 mm <sup>2</sup>	
Compressão duplo G 70 mm <sup>2</sup>	Conectores	70 x 70 mm <sup>2</sup>	
Compressão G 70 mm <sup>2</sup> x 3/4	Conectores	70 mm <sup>2</sup> x 3/4	
Luva roscada 3/4	Luvas	3/4 x 3/4	
molde solda CC 70 x 70 mm <sup>2</sup>	Soldas	70x70 mm <sup>2</sup>	
molde solda CH 70 mm <sup>2</sup> x 3/4	Soldas	70 mm <sup>2</sup> x 3/4	

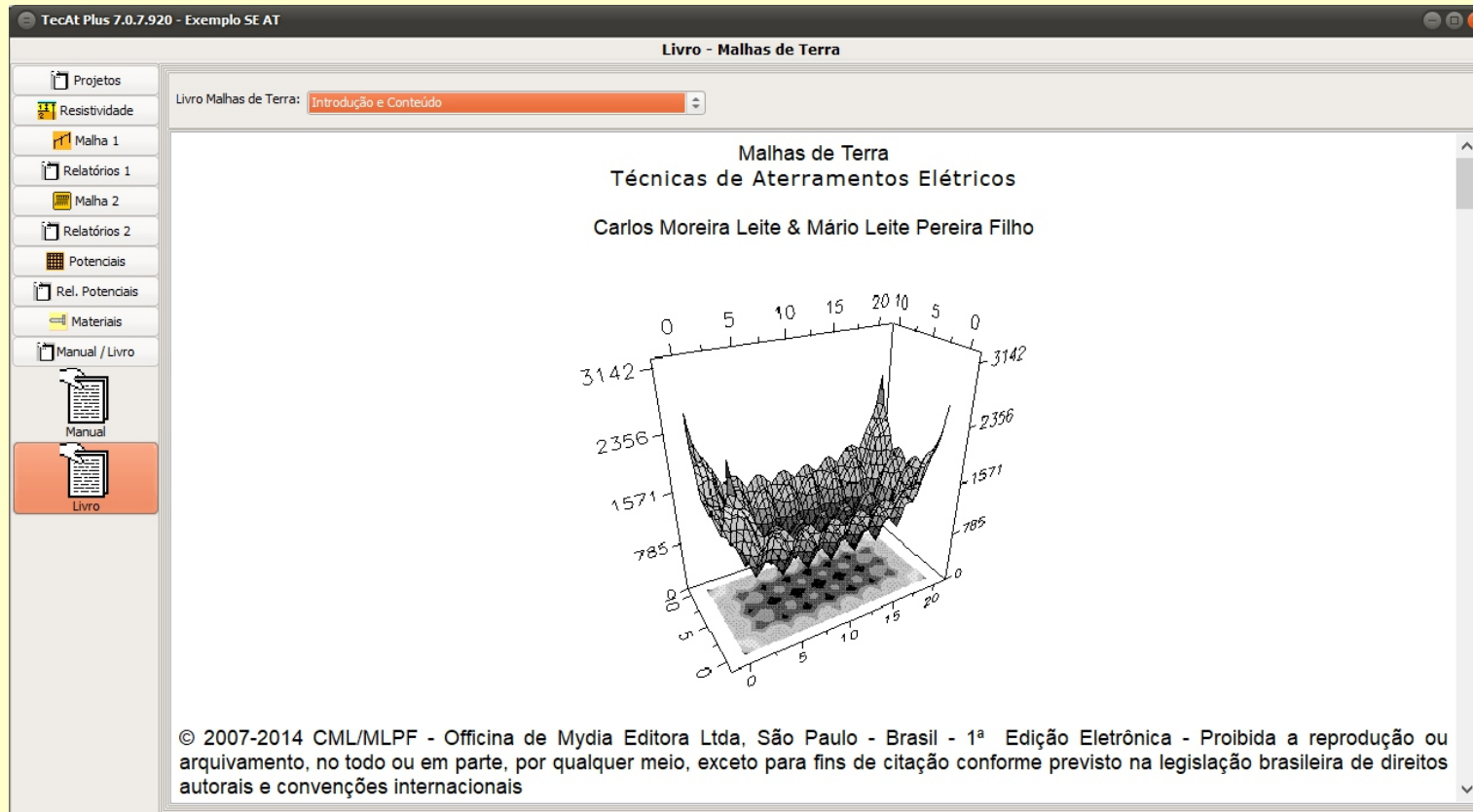
Comentários:

TecAt has a fully editable material and supplier database and you can even generate data-sheets for all the materials you are going to use in a project.

# TECAT PLUS 7.0

Software for Grounding Grid design

## Documentation



From within the program, you have access to the manual and the book 'Malhas de Terra', with all the necessary theory. It also has several tutorials in PDF format to practice the many functions of TecAt.

MULTI-STANDARDS	exceeds the requirements of IEC, ABNT and IEEE standards
MULTI-IDIOMS <sup>[4]</sup>	English; Português; Español
MULTI-USUER	single-user versions and multi-user: 2 users or more on the same network
SOIL RESISTIVITY	Stratification in 2, 3 or 4 layers
SUBSTATION GRIDS	Numerical calculations in 2, 3 or 4 layers Ground resistance Touch, Step, and Surface Potentials
INDUSTRIALS, COMERCIALS AND RESIDENTIALS GRIDS	Any format, up to thousands of conductors of varying dimensions, horizontal, vertical or inclined, numerical calculation in 2, 3 or 4 layers
MATERIALS LIST	Material Database (editable) Detailed and consolidated list Data sheet for each component
ANALYSIS	Comparative analyzes of resistance, cost and term of different solutions
REPORTS	Data listing and complete results, photos Various charts for risk and cost analysis Material datasheets

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