

How to design a vertical sundial by
means of the
Orologi Solari
program

... e allora ?

It is not that difficult to design and to build a vertical sundial: everyone could experiment.

For sundial design the following parameters are essential:

- Latitude and longitude of the place
- Declination of the wall

Moreover the following parameters have to be defined:

- Dial dimensions
- Style length
- Style position
- Type of hour lines to be displayed
- Day (or declination) lines

The following pages show how to define all these parameters and how to use Orologi Solari to proceed with the design of the sundial.

Latitude and longitude : with the aid of a GPS receiver

These parameters can be obtained in several ways.

The first method is by means of a GPS receiver:

1. Read the coordinates of the place from the GPS receiver
2. Introduce the coordinates in the second page ("Geographical coordinates") of sundial parameters in Orologi Solari.

The screenshot shows a software window titled "Sun dial parameters". It has several tabs: "Options", "Background image", "Roof and balcony", "Map", "Buildings", "Type", "Geographical coordinates", "Dial", "Style", "Hour lines", and "Day lines". The "Geographical coordinates" tab is selected. Inside this tab, there is a "Name" field with the text "Filia - fraz. di Castellamonte". Below it, there are two fields for coordinates: "Latitude [d:m:s]" and "Longitude [d:m:s]". The latitude field is set to "045:24:00" and has a dropdown menu set to "north". The longitude field is set to "007:41:00" and has a dropdown menu set to "east". To the right of these fields are two buttons: "Places..." and "Paste from Google Earth". At the bottom of the window, there are three buttons: "?", "OK", and "Annulla", and a partially visible "Applica" button.

Latitude and longitude : with the aid of Google Earth

A fast and efficient method to find the local coordinates is by means of Google Earth:

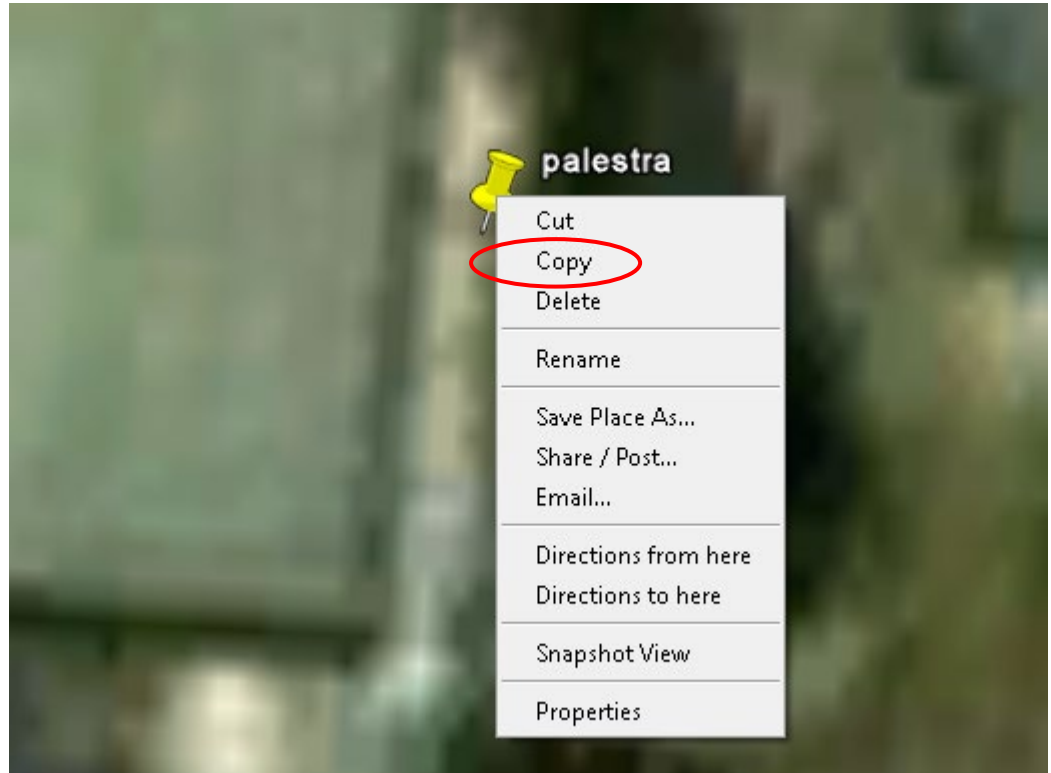
1. Identify on the map the place where the new sundial will be built, if necessary zoom in to obtain a better precision
2. Keep the mouse cursor on the place and read the geographical coordinates from the status line in the bottom of the map
3. Introduce the coordinates in the second page ("Geographical coordinates") of sundial parameters in Orologi Solari



Latitude and longitude : by means of Google Earth placemarks

One more method that makes use of Google Earth is here described:

1. Identify on the map the place where the new sundial will be built, if necessary zoom in to obtain a better precision
2. Add a placemark in that place ("Add", "Placemark")
3. Click on the placemark with the right mouse button and choose "Copy"
4. In the second page ("Geographical coordinates") of sundial parameters in Orologi Solari click on "Paste from Google Earth".



Latitude and longitude : with the aid of Orologi Solari database

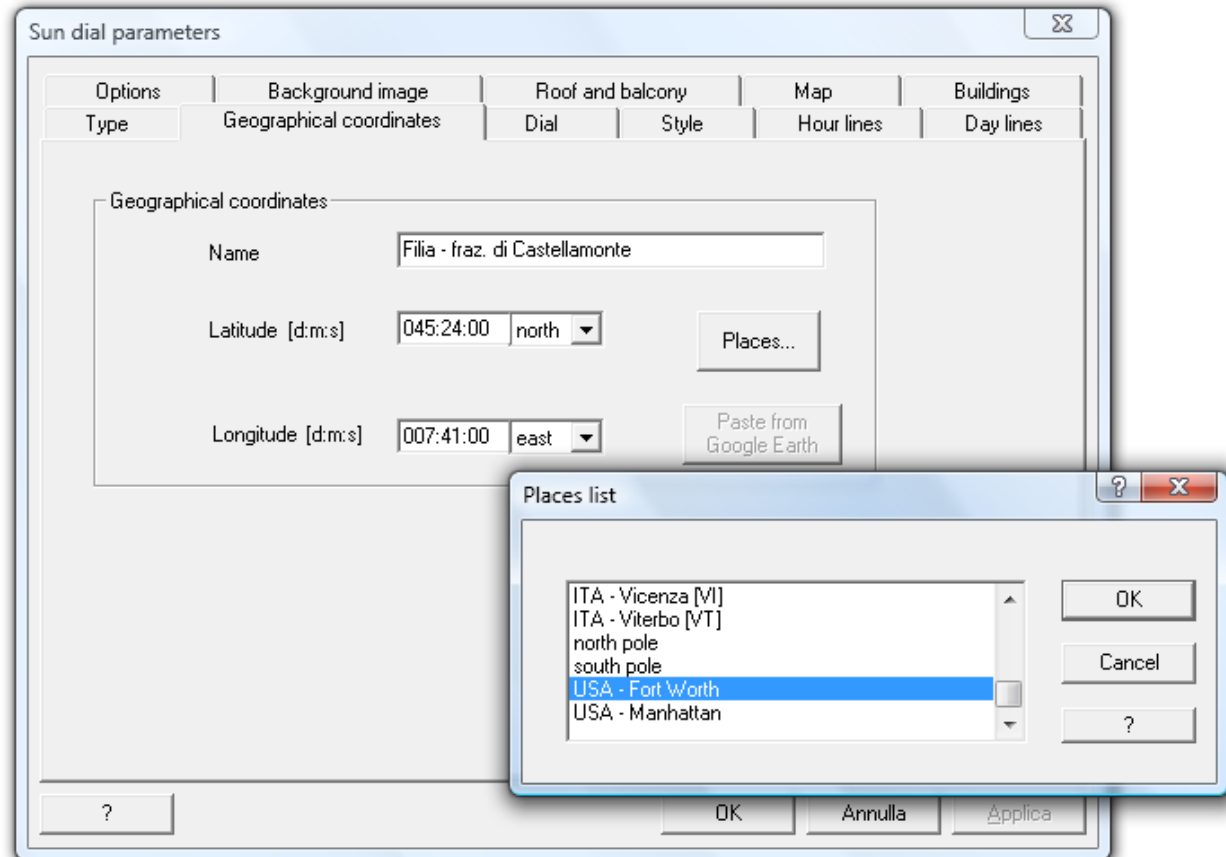
Orologi Solari includes a list of places together with their geographical coordinates.

Try to find the place you need from this list.

1. In the second page of the OS sundial parameters click on "Places".

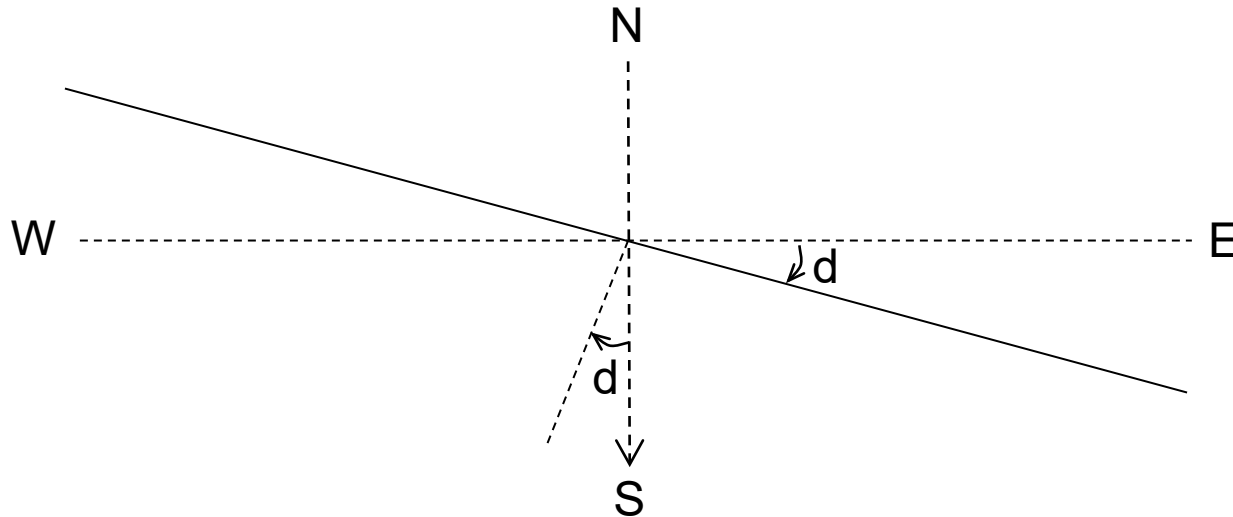
2. Select the desired place from the list

3. Click "OK"



Wall declination

Wall declination is by definition the angle measured between the perpendicular to the wall and the south direction.



This angle is considered to be negative for east declining dials, positive for west declining dials.

Wall declination

Orologi Solari can help you to perform this measurement by means of two possible methods:

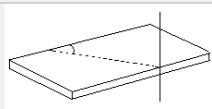
- method of the horizontal table
- method of the dummy style

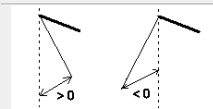
To get more details look at [“How to measure the wall declination by means of the Orologi Solari program”](#).

Find the declination of the wall

Geographical coordinates:
Latitude [d.m.s] [045.24.43] Longitude [d.m.s] [007.41.15] Places...

Measurement date:
Time zone [GMT +1 (TMEC)] for non-standard time zones :
+ minutes [0] Today

Method 1
☒ 
Measure the angle (in decimal degrees) between the shadow and the wall

Method 2
☐ 
style length [15]
Measure the distance between the tip of the shadow and the plumb line

Measurement data

<input checked="" type="checkbox"/>	1	venerdì 12 aprile 2024	<input checked="" type="checkbox"/> DST	11:00:23	angle	.22.5	declination	109.429	west
<input checked="" type="checkbox"/>	2	venerdì 12 aprile 2024	<input checked="" type="checkbox"/> DST	11:24:13	angle	-17.1	declination	108.889	west
<input checked="" type="checkbox"/>	3	venerdì 12 aprile 2024	<input checked="" type="checkbox"/> DST	11:45:52	angle	-8.7	declination	111.607	west
<input type="checkbox"/>	4	venerdì 12 aprile 2024	<input checked="" type="checkbox"/> DST	22:00:23	angle	0	declination		
<input type="checkbox"/>	5	venerdì 12 aprile 2024	<input type="checkbox"/> DST	22:00:23	angle	0	declination		
<input type="checkbox"/>	6	venerdì 12 aprile 2024	<input type="checkbox"/> DST	22:00:23	angle	0	declination		
<input type="checkbox"/>	7	venerdì 12 aprile 2024	<input type="checkbox"/> DST	22:00:23	angle	0	declination		
<input type="checkbox"/>	8	venerdì 12 aprile 2024	<input type="checkbox"/> DST	22:00:23	angle	0	declination		
<input type="checkbox"/>	9	venerdì 12 aprile 2024	<input type="checkbox"/> DST	22:00:23	angle	0	declination		
<input type="checkbox"/>	10	venerdì 12 aprile 2024	<input type="checkbox"/> DST	22:00:23	angle	0	declination		

RESULTS

mean declination [109.975] west

Compute Insert into the project ?

Dimension of the dial

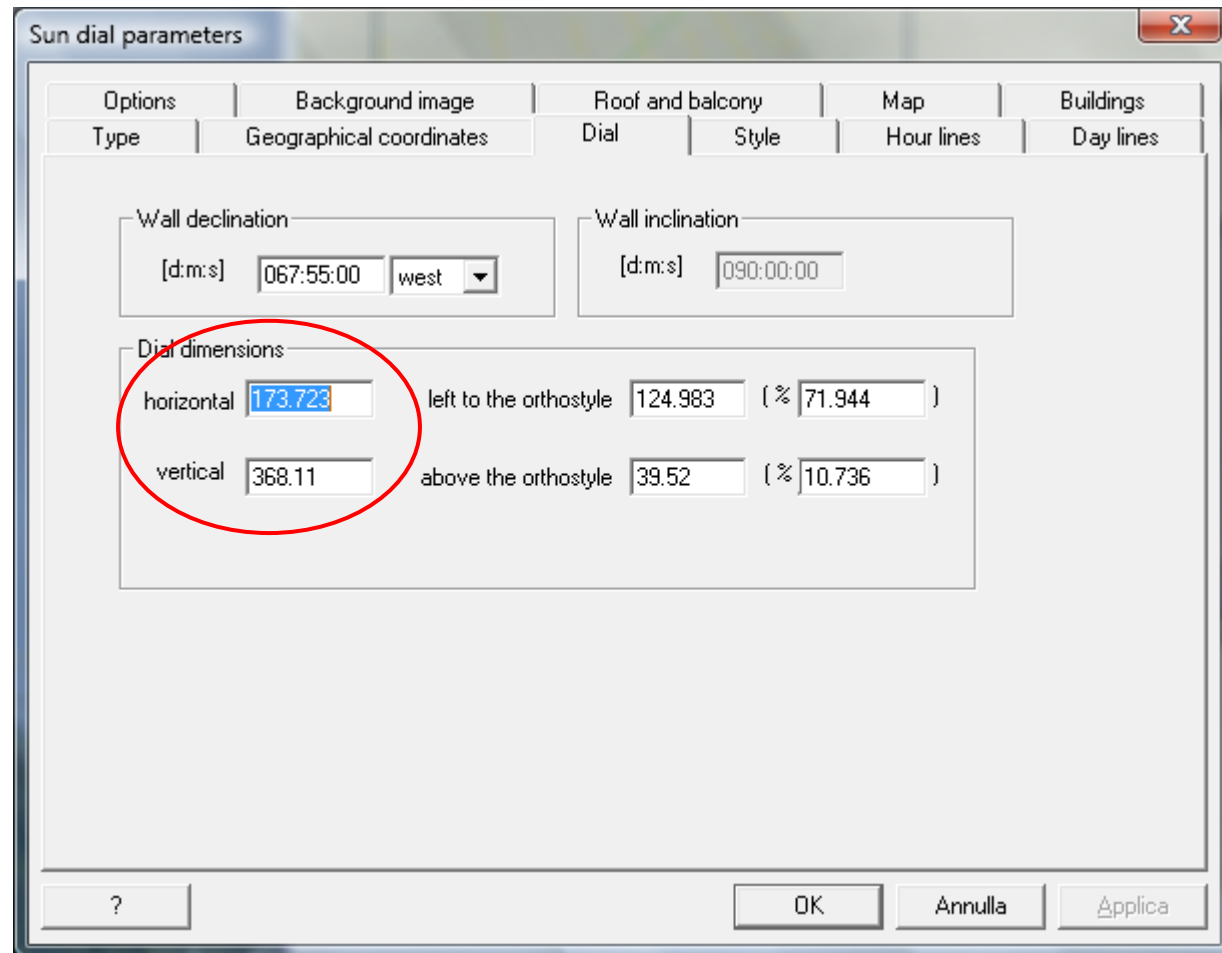
Width and height of the dial do not have any effect on the position of the hour lines and must be chosen in order to include the most important part of the dial in the available wall surface.

Dimensions can be included in OS:

1. directly in the third page ("Dial") of dial parameters
2. by dragging the frame borders with the left mouse button pressed

Current dial dimensions are always available in the status line of the program, in the right bottom side of the window.

(L x A) = (169.88 x 157.04)



Style length

Style length is a scale factor for the dial whose dimensions will be proportional to the value of the style length. The style length should so be chosen to be proportional to the dial dimensions. A 1:5 – 1:6 ratio can be a valid starting point.

Style dimension is defined in the fourth page (“Style”) of the dial parameters. Here the parameter to be inserted is the length of the orthostyle.

Keys + and – can be later used to modify in real time the dimension of the style of a +/- 1% factor.

Sun dial parameters

Options	Background image	Roof and balcony	Map	Buildings
Type	Geographical coordinates	Dial	Style	Hour lines

Extreme points of the style (x , y , z)

P1 = (0 , 0 , 0)

P2 (ortostyle) = (0 , 0 , 50)

POLAR ORTHO

Limit for substyle height < 45 (0-45 deg.)

? OK Annulla Applica

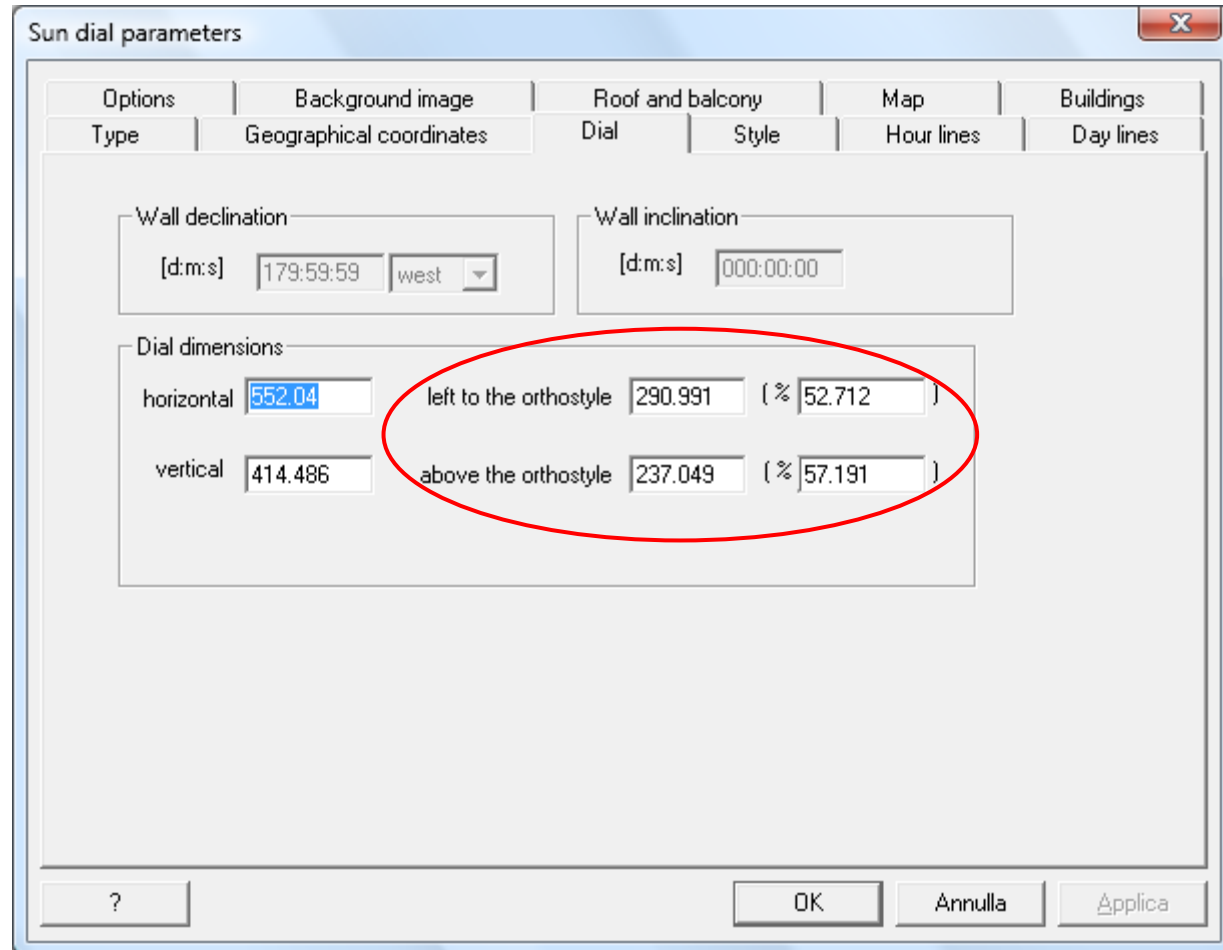
Style position

The position of the style in the dial must be chosen in such a way to optimize the available space and to give more attention to hour lines that have a better sun exposition.

This is usually achieved by moving the style to the left when declination is to east and to move it to the right when the declination is to west.

In OS the position of the style can be :

1. inserted in the third page of dial parameters as an absolute or percentage value
2. graphically modified by dragging the style together with all the dial lines by means of the left mouse button



The screenshot shows the 'Sun dial parameters' dialog box with the 'Style' tab selected. The 'Dial dimensions' section is circled in red, indicating the parameters for the style's position. The 'horizontal' dimension is set to 552.04, and the 'vertical' dimension is set to 414.486. The 'left to the orthostyle' offset is 290.991 (52.712%), and the 'above the orthostyle' offset is 237.049 (57.191%).

Parameter	Value	Percentage
horizontal	552.04	
vertical	414.486	
left to the orthostyle	290.991	52.712%
above the orthostyle	237.049	57.191%

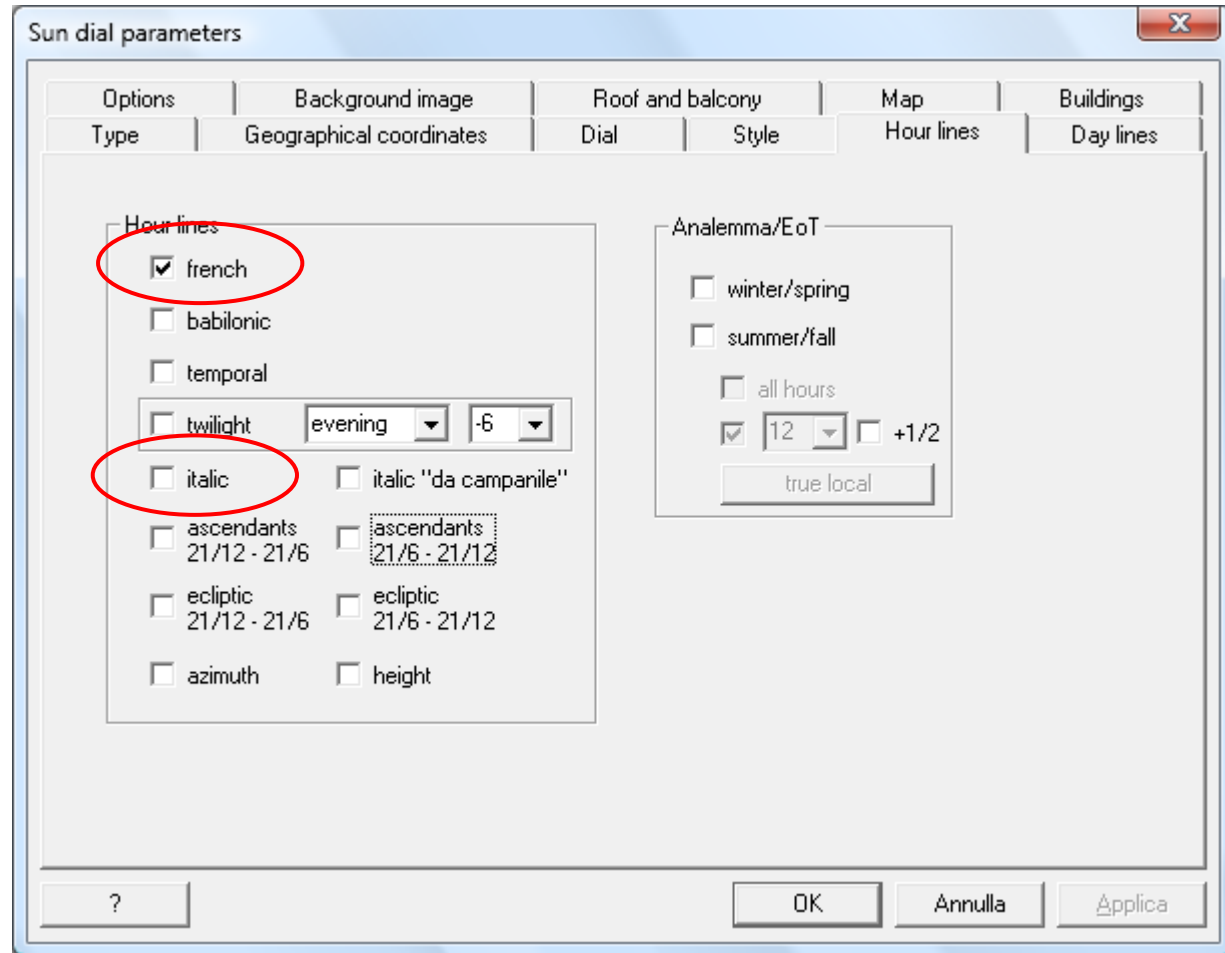
Type of hour lines

Orologi Solari allows the design of sundials including the most common types of hour lines and also some types of time measures that have only been rarely used in the past.

The type of hour lines is defined in the fifth page of dial parameters.

The most common hour lines in use today are the french hours (the ones commonly used by everyone today) and the italic hours (or hours to sunset).

For french hours, it is worthy to note that the choice between local hours and time zone hours, to be done in the first page, has an effect on the hour lines: in the first case the dial will show the true local sun hours, in the second case it will take into account the longitude difference between the current place and the reference meridian (TMEC for Italy and for Central Europe).



Day lines (or declination lines)

Several sundials include day lines (or declination lines) together with hour lines, thus allowing to know the approximate date of the day.

OS allows this choice in the sixth page of dial parameters.

Possible choices are:

1. Equinox line
2. Solstice lines
3. Additional zodiac lines

Moreover it is possible to draw the line that corresponds to some specific date in the year (f.i. a birthday).

It has to be noted that in this case the length of the style is important as the actual date is shown by the tip of the shadow of the style.

The screenshot shows the 'Sun dial parameters' dialog box with the 'Day lines' tab selected. The 'Day lines' section is circled in red, containing three checked options: 'Equinox', 'Solstice', and 'Other'. The 'Specific date line' section is also circled in red, showing a checkbox and a date dropdown set to '17/01'. The 'Date lines' section below contains options for 'ellipse' and 'rectangle', and a range selector for '1/1 -> 31/12'. The 'Date lines' section also includes input fields for 'x min', 'x max', 'y min', 'y max', 'centre', 'rotation', and 'degree'.