

March 5th 2009  
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Versie 1.0

## Wrongly placed sundials with polar styles

Every now and then, we see polar sundials which are wrongly placed. The polar style is not directed to Polaris and therefore not parallel to the earth axis. The sundial indicates the wrong time. Some examples of wrongly placed sundials are the armillary spheres in (...many...) gardens, “vertical sundials” bought in a garden shop and placed on a nice wall, sundial-souvenirs from other countries, placed on the garden table and many more. We find also some more “on purpose” displaced sundials. In the Netherlands we have a nice vertical sundial at monastery “Alverna” at Aerdenhout which is oblique replaced in the new garden. Also at the well known “Rijksmuseum” in Amsterdam we have a nice wall mounted sundial. The sundial is replaced over 2 kilometer from a canal house including its wall(!). The wall with sundial is wrongly placed in the garden of the Rijksmuseum.

*One can ask what time is indicated by these wrongly placed sundials.*

We can find the answer by the use of the “spider sundial”, see *Figure 1*.



*Figure 1: a spider sundial*

A spider sundial is build up of a plate which carries the lines and perpendicular the shadow casting rod. The rod is often placed to the zenith. Concentric around the rod, the date circles are found. In principle, every date has its circle, however, in practice we draw the date circle of the 1<sup>st</sup> of each month or the seasons only. The curved hour lines intersect the date circles. The time is read where the shadow of the rod intersects the date circle of today<sup>1</sup>.

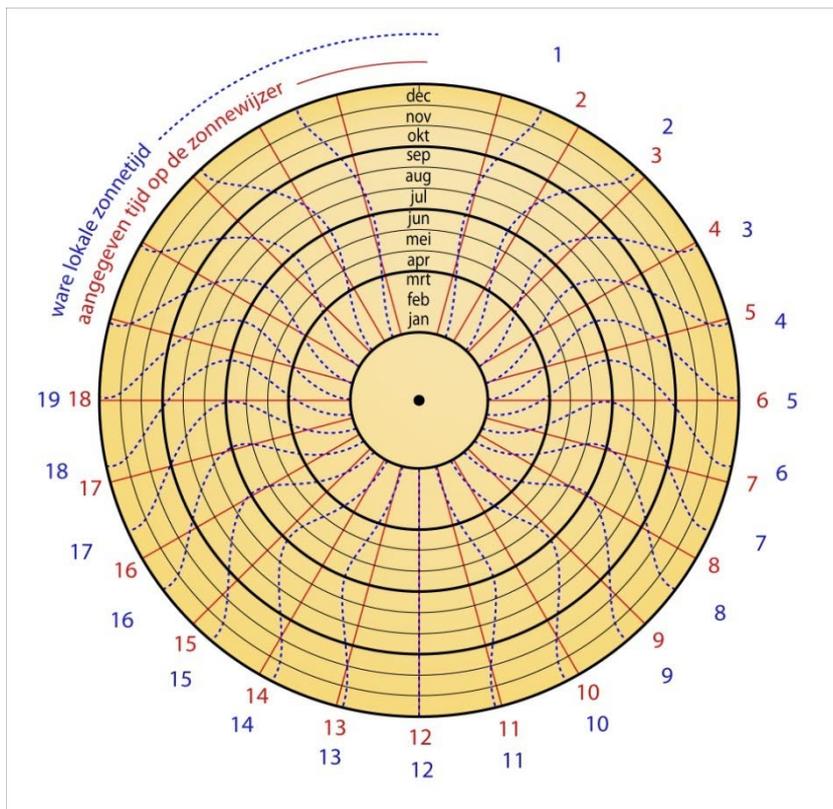
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<sup>1</sup> For a more detailed manual, see [ww.shop.analemma.nl/spin%20staaf%20web%20pdf.pdf](http://ww.shop.analemma.nl/spin%20staaf%20web%20pdf.pdf)

If we orient the spider sundial with its shadow casting rod towards Polaris, the plate with the lines is equatorial placed and basically we constructed an equatorial sundial. If we calculate the hour lines and date lines for the spider in this orientation we will find the well known homogenous hour line distribution. These hour lines are colored red in *Figure 2*. The spider will indicate the right time, together with a rightly placed sundial.

We think the spider and a rightly placed sundial as connected and next we replace the 2 sundials in the wrong position. The rod of the spider and the shadow caster of the (now wrongly placed) sundial are still parallel. However they are both not directed to Polaris.

For this position of the spider we calculate the hour lines. An example of what you may find is displayed with blue dotted lines in *Figure 2*. These lines are calculated for an armillary sphere made to indicate the local solar time at 52 degrees latitude, however, placed on 22 degrees latitude. The "Polar" style is directed north (but not towards Polaris).



*Figure 2: time converting plate for an armillary sphere designed for 52 ° northern latitude, placed at 22 ° northern latitude however... Blue dotted line: local solar time; red homogeneous lines: indicated time by the wrongly placed sundial.*



Since we have now the “time converting plate” for this wrongly placed armillary sphere (*Figure 2*) it is easy to find the time, indicated by this wrongly placed sundial. The homogeneous hour lines is still present on both the spider and the wrongly placed sundial. The blue dotted hour lines on the spider however, indicate the actual shadow of the shadow caster(s).

Below you will find some examples (l.s.t. means Local Solar Time):

At 12 o'clock l.s.t. the wrongly placed sundial indicates 12 o'clock;

At 17 o'clock l.s.t. (dotted line) in June, the wrongly placed sundial indicates 18 o'clock;

At 10 o'clock l.s.t. (dotted line) in April, the wrongly placed sundial indicates 9:30 o'clock;

At 16 o'clock l.s.t. (dotted line) in December, the wrongly placed sundial indicates 15:35 o'clock;

Let us now investigate the sundial at the Rijksmuseum, see *Figure 3*. On the website of the “Amsterdam Sundial trail” we find that the sundial is made  $12^\circ$  west declining, however, it is placed  $50^\circ$  east declining<sup>2</sup>. Following the same procedure, we “connect” the spider the rightly placed sundial and we find the homogeneous hour line distribution. Next, we displace the sundial(s) to the wrong position at the Rijksmuseum and we calculate the hour lines for the spider in this position. The result we find in *Figure 4*.



*Figure 3: the sundial at the Rijksmuseum, photographed at 17 June 2008, approx. 12:10 Middle European Summer Time.*

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<sup>2</sup> See the site of Frans Maes: <http://www.fransmaes.nl/sundials/amsterdam/index.html>

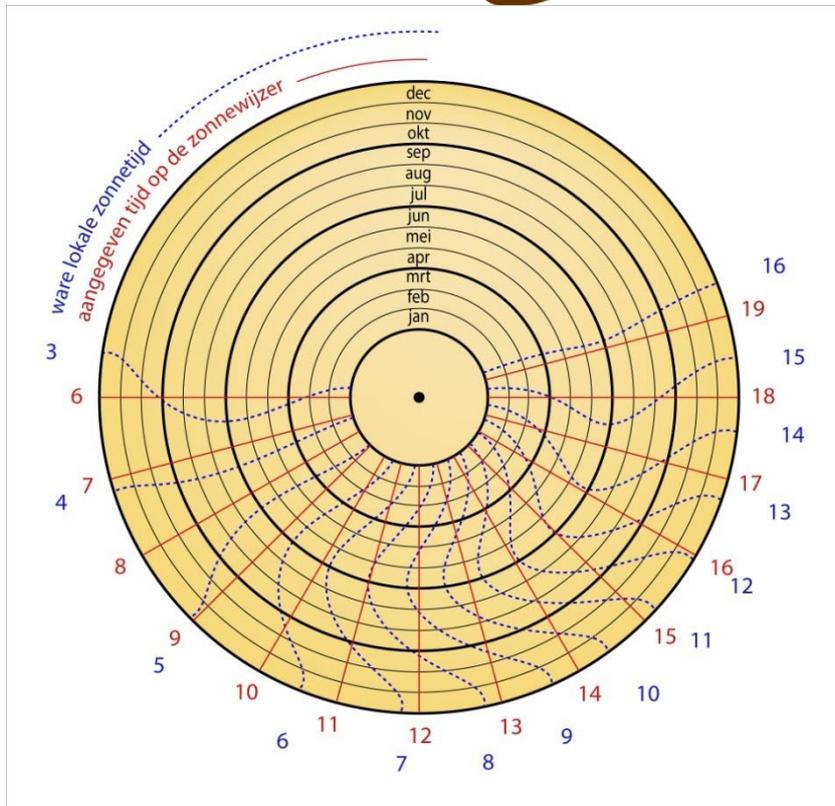


Figure 4: time converting plate for a wall mounted sundial designed for 12° west declining, placed 50° east declining. Blue dotted lines: Local Solar Time. Red homogeneous lines: the indicated time by the wrongly placed sundial.

The pattern is a bit wilder since the sundial is displaced from the evening sun to the morning sunshine. Below some examples to find the indicated time by the wrongly placed sundial:

At 12 o'clock l.s.t. in December, the wrongly placed sundial indicates 16:00 o'clock

At 8 o'clock l.s.t. in June, the wrongly placed sundial indicates 11:00 o'clock

The photo of *Figure 3* I have made at June 17<sup>th</sup> 2008 when Fer en Sietske de Vries (Dutch Sundial Society "de Zonnwijzerkring"), Fred Sawyer, his wife (North American Sundial Society) and I were watching sundials in Amsterdam. We were blessed with lots of sunshine. After some coffee we went to the Rijksmuseum at approx. 12.00 or 12.15 (M.E.S.T)<sup>3</sup>. The sundial indicates 12.55 however. From *Figure 4* we derive that the photo has been taken at approx. 10.30 local solar time (12.10 M.E.S.T). This seems to be right. On our way to the lunch we walked back to the Dam square in Amsterdam. We arrived about 1 hour later and I took the photo of the sundial at the "Nieuwe Kerk" on the Dam square of *Figure 5*. This sundial indicates 11:25 (which is 13:05 M.E.S.T in the Netherlands)... perfect!

Kind Regards,  
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<sup>3</sup> M.E.S.T indicates: Middle European Summer Time



*Figure 5: Photo of the sundial at the Nieuwe kerk at Dam square in Amsterdam, approx. taken 1 hour later than the photo of the sundial at the Rijksmuseum. The sundial indicates 11:25 (about 13.05 M.E.S.T).*