



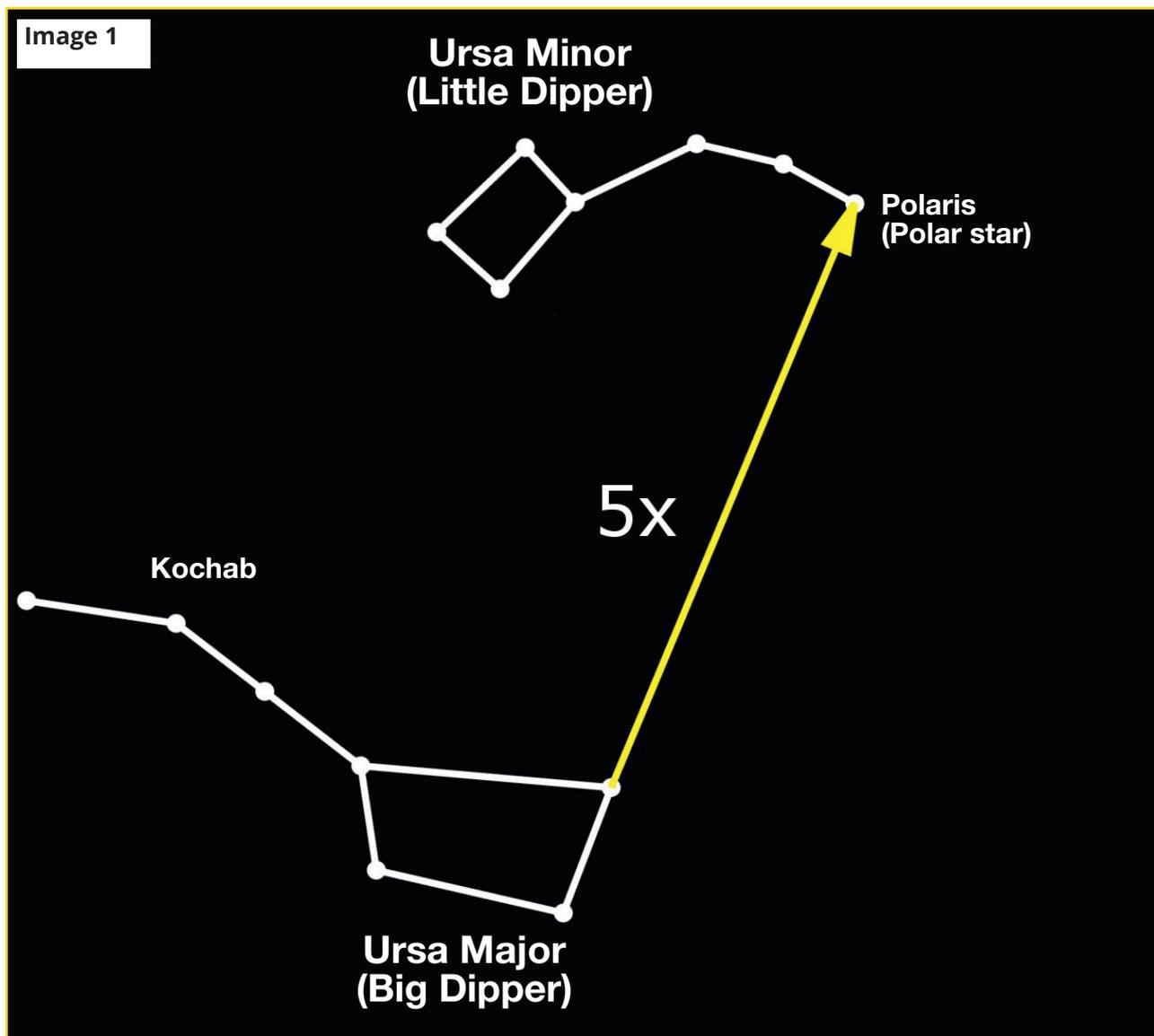
**Zeroing of a mount  
with the help of the Kochab method**

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**ADDITIONAL INSTRUCTIONS**

Apparently the stars move in the sky at night. However, this is actually the rotation of the earth on its own axis. In order to be able to compensate this movement as easily as possible, or even automatically in the case of motorised mounts, so-called equatorial mounts (also called parallactic mounts or German mounts) must be "aligned". This means that the RA axis (right ascension axis or hour axis) of the mount is brought parallel to the Earth's axis. When this is done, the earth rotation can be compensated by a corresponding counter rotation of only this one mount axis.

This alignment of the mount is called "zeroing". During this process, the RA axis is aligned to the north celestial pole. Many mounts have a polar finder built into the RA axis for this purpose, or installed in parallel on the RA axis. Such a polar finder is a small telescope of its own, which is aligned with the north celestial pole and thus brings the RA axis nearly exactly parallel to the Earth's axis. Fortunately, in the Earth's northern hemisphere, there is a rather bright star very close to the actual north celestial pole, the North Star or "Polaris".



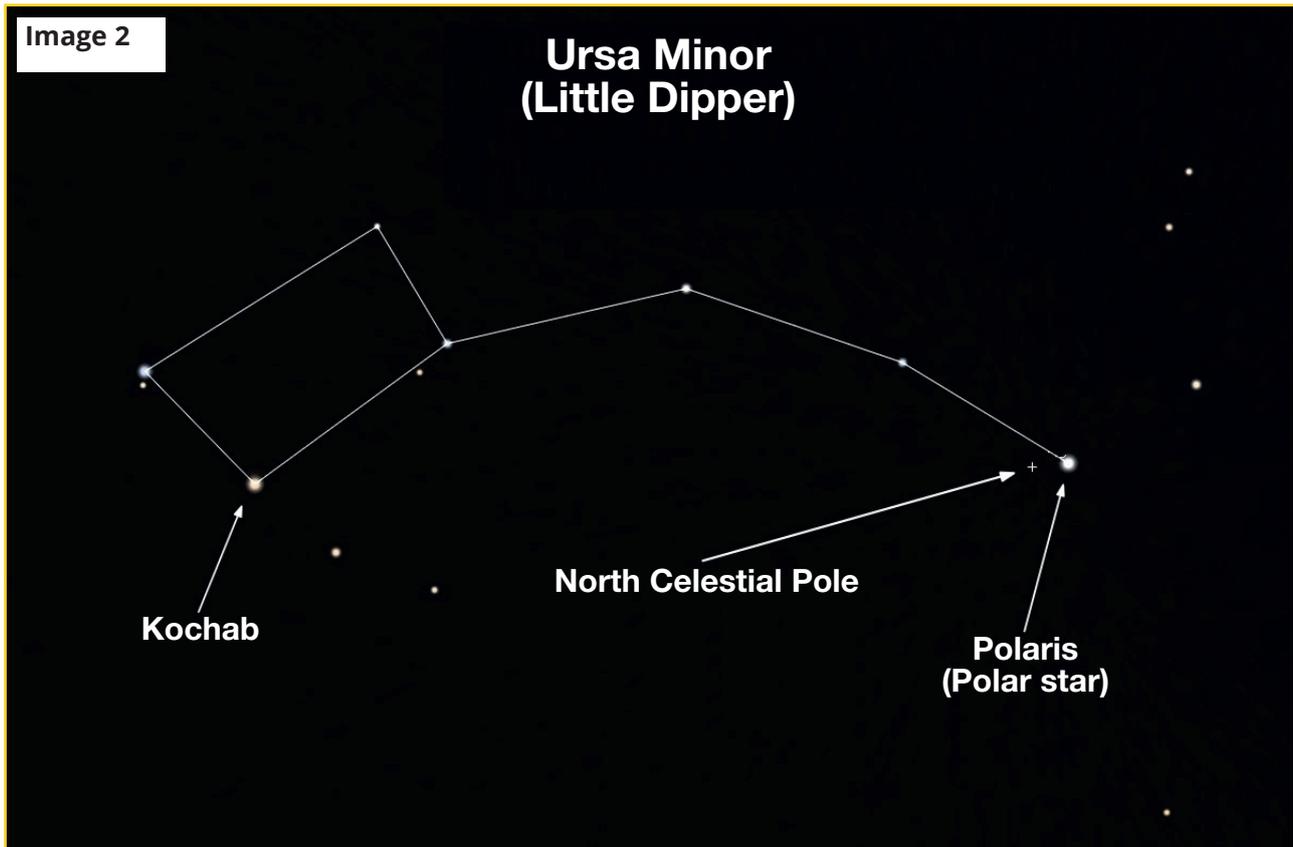
Polaris is very easy to find, just draw an imaginary line along the two back box stars of the constellation Big Dipper, 5 times as long as the distance between the two box stars, then you come out directly at Polaris. Polaris is the foremost star on the drawbar of the Little Dipper. Please refer to figure "Image 1".

In most cases it is sufficient to adjust the polar altitude and azimuth settings for the RA axis on the tripod head so that the polar star is positioned on the center mark when looking through the polar finder. For visual observation, positioning via goto systems and even for photography with small focal lengths at short exposure times, this simple form of polarization is usually accurate enough.

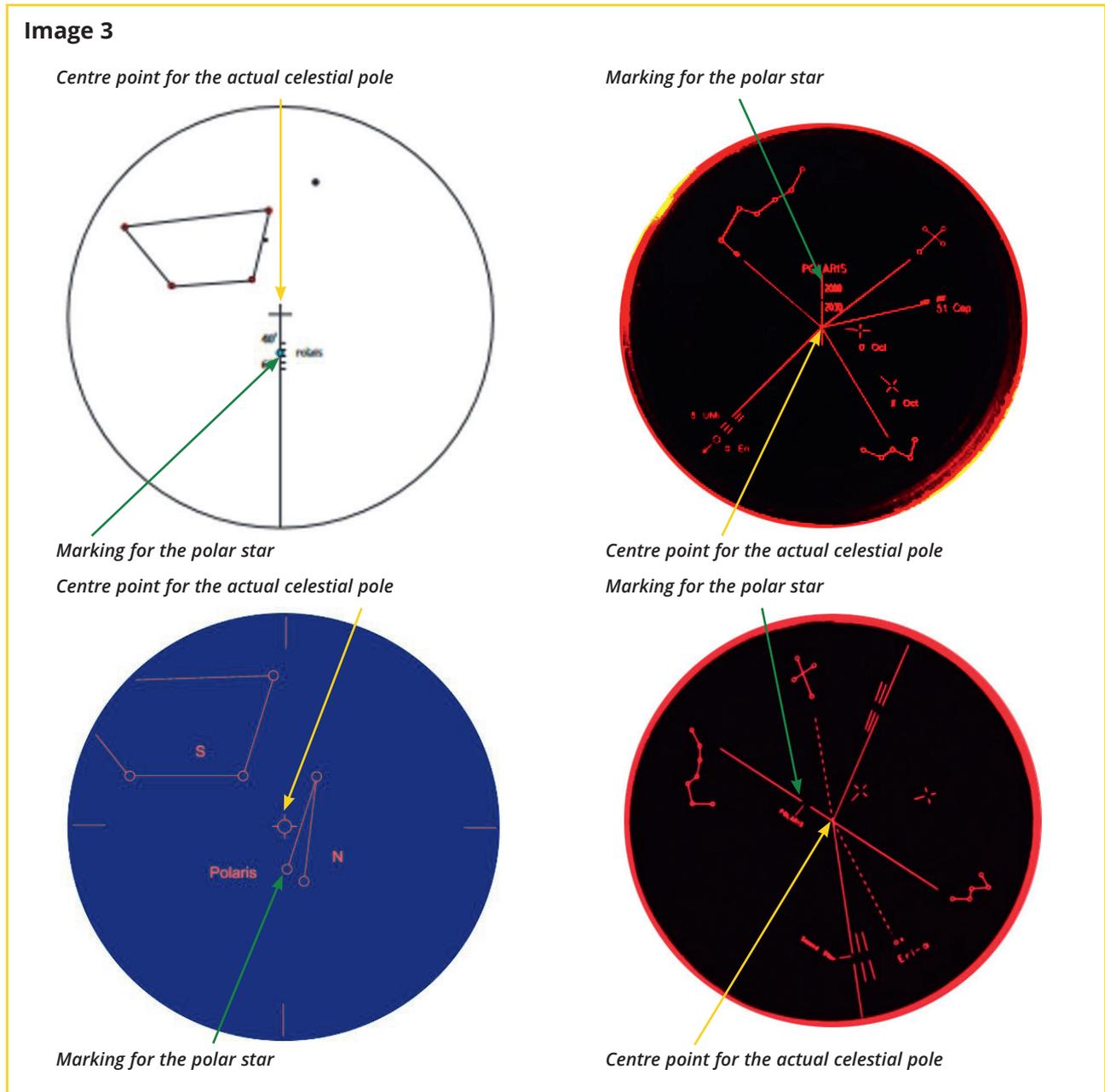
The situation is different when tracking during photography with large focal lengths and longer exposure times. This is because Polaris is not exactly at the position of the actual celestial pole, but slightly off it. Therefore, a more precise alignment to the actual celestial pole may be necessary for more accurate tracking.

Due to the rotation of the earth around its own axis, the pole star naturally also appears to move and circle around the actual celestial pole. Thus it stands at each date and at each time in another direction away from the celestial pole. This makes an exact classification to the actual celestial pole a little more complicated. There are several methods for accurate zeroing. A rather simple and yet very accurate method is the so-called Kochab method, which we recommend and describe here for an accurate classification.

Kochab is a rather bright star in the constellation of the Little Dipper. And for all practical purposes, the positions of Kochab, the actual celestial pole, and that of Polaris as seen from Earth are in a straight line. Please refer to figure "Image 2".



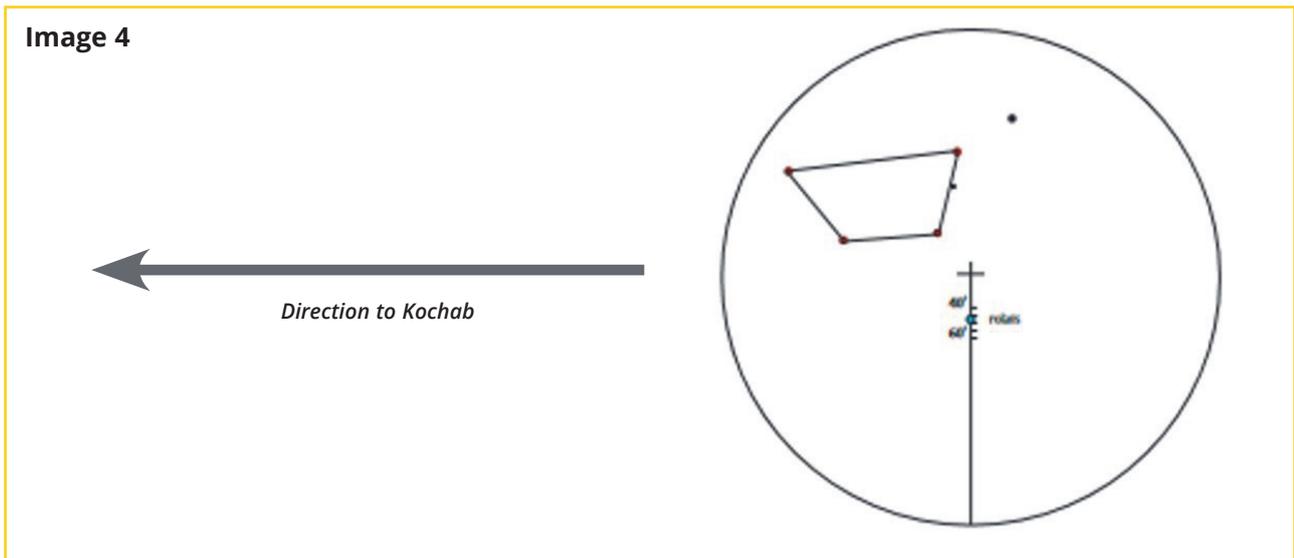
Polar finder scopes can have different engraving plates. As a rule, however, they all have a centre marker, and a marker for the position of the pole star. Here in figure "Image 3" a few examples of engravings in different pole finders:



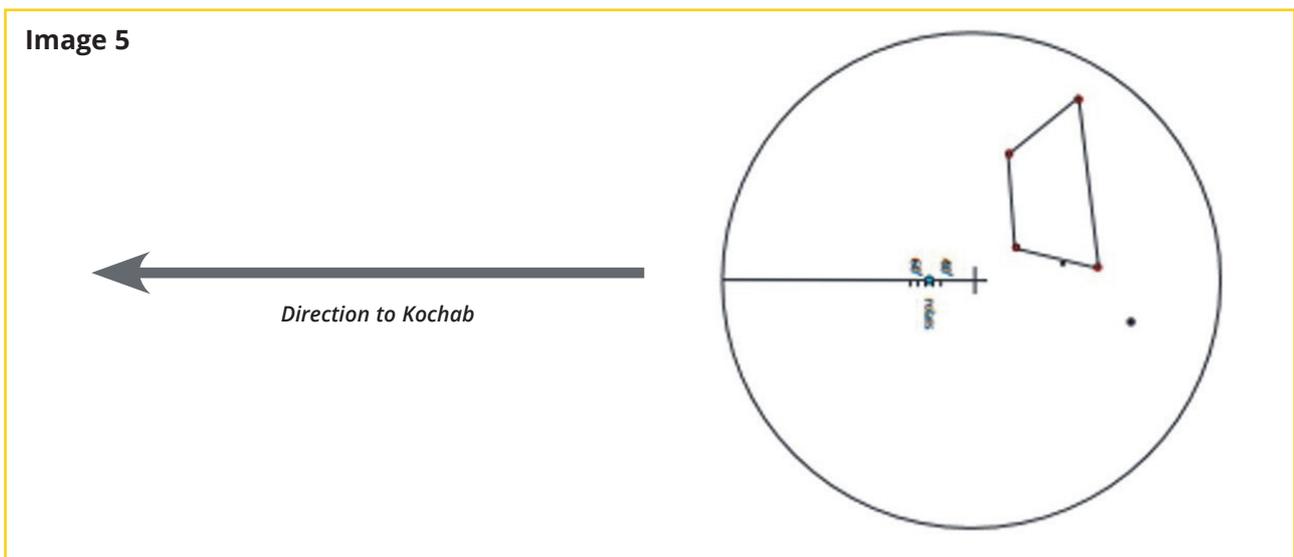
In order to find the correct position for the polar star, look sideways past the mount in which direction the star Kochab is located. Of course Kochab is not visible in the polar finder's field of view, the distance between Kochab and Polaris is much too large for that.

Let's assume the situation would be as shown in figure "Image 2", Kochab would be to the left of Polaris. The real order on the imaginary line between Kochab and Polaris is Kochab-Celestial Pole-Polar Star. However, since most polar finder scopes, like any astronomical telescope, image laterally reversed, when viewed through the polar finder there must therefore be in the order Pole Star - Celestial Pole. Kochab, of course, remains on the far left because, as described, it is outside the field of view of the pole finder anyway, and therefore cannot change its position by the side-inverted view through the pole finder.

Let's take as an example here figure "Image 4":



Kochab is outside the field of view of the pole seeker somewhere further to the left. Still, the centre mark and the mark for Polaris on the engraving plate of our pole finder are not in line with the direction to Kochab. Therefore, the clamping of the RA axis is now loosened and the axis is rotated. The pole finder rotates with it, and thus the orientation of the engraving plate also rotates. We need, as just described, in the reverse imaging polar finder the Kochab-polar star-celestial pole alignment on a straight line. So rotate the RA axis until this alignment is correct, as shown in figure "Image 5".



Now clamp the RA-axis again. Then adjust the polar altitude and azimuth settings for the RA axis on the tripod head so that the polar star comes to rest on the Polaris mark when looking through the polar finder. Thus we now have the actual north celestial pole exactly on the centre mark of the pole finder, with which the mount is perfectly aligned.

**Please note:**

If you actually have one of the rare polar finders that images true-sided, such as the Explore-Scientific polar finder 0620160 with Amici prism, then the sight of image "Image 5" in the polar finder must of course be the other way around.

The other engravings, which many pole finders have apart from the polar star and center point markings, are partly used for other methods of northing, and/or "southing" in the southern hemisphere, and therefore play no further role here.

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