

$$\begin{aligned} \text{Magnetic Declination:} & \Delta \\ \text{Magnetic North:} & MN \end{aligned}$$

$$\text{True North:} \quad TN = MN - \Delta$$

*Polarisation Readings:*

$$\begin{aligned} s_1 & & s_2 \\ a_1 &= \frac{1}{10^{s_1} + 1} & a_2 = \frac{1}{10^{s_2} + 1} \\ b_1 &= 1 - 2a_1 & b_2 = 1 - 2a_2 \end{aligned}$$

$$c = \begin{cases} -\sqrt{3} \tan(2\phi - \frac{\pi}{3}) \\ -\sqrt{3} \tan(2\phi - \frac{\pi}{3}) \end{cases}$$

$$\begin{aligned} \text{Solar Azimuth:} \quad \phi &= \frac{\arctan(-\frac{c}{\sqrt{3}}) + \frac{\pi}{3}}{2} \\ \phi &= \text{Solar Azimuth} \end{aligned}$$

$$\begin{aligned} \text{Solar Altitude:} \quad \tan(h_s) &= \frac{\sqrt{2} \sin(s_1 - s_2)}{\sqrt{\left[\frac{-\sqrt{2} \sin(s_1 + s_2)}{2}\right]^2 + [\cos(s_1) \cos(s_2)]^2}} \\ h_s &= \arctan \left[ \frac{\sqrt{2} \sin(s_1 - s_2)}{\sqrt{\left[\frac{-\sqrt{2} \sin(s_1 + s_2)}{2}\right]^2 + [\cos(s_1) \cos(s_2)]^2}} \right] \\ h_s &= \text{Solar Altitude} \end{aligned}$$

$$\begin{aligned} \text{Declination Angle:} \quad \delta &= 23.45 \frac{\pi}{180} \sin \left[ \frac{2\pi(284 + n)}{36.25} \right] \\ n &= \text{day} \end{aligned}$$

$$\text{LATITUDE:} \quad \cos(\phi) = \frac{\sin(\delta) - \sin(h_s) \sin(\text{LATITUDE})}{\cos(h_s) \cos(\text{LATITUDE})}$$

$$\text{Hour Angle:} \quad \omega = \sin^{-1} \left[ \frac{-\cos(h_s) \sin(\phi)}{\cos(\delta)} \right]$$

$$\text{LONGITUDE:} \quad \text{LONGITUDE} = \omega - (UTI + E) * 15 + 180$$