

f := focal length (mm)
 d_o := object distance (mm)*
 h_o := object height (mm)*
 h_i := image height (px)*
 h_s := image sensor height (mm)
 H := image sensor height (px)*
 FOV := vertical field of view (angle)

* indicates known quantity

$$\begin{aligned}
 FOV &= 2 \tan^{-1} \frac{h_s}{2f} \\
 \frac{f}{d_o} &= \frac{h_i}{h_o} \\
 \Rightarrow f &= d_o \frac{h_i}{h_o} \text{px} \\
 h_s \text{mm} &= H \text{px} \\
 \Rightarrow 1 \text{px} &= \frac{h_s}{H} \text{mm} \\
 \Rightarrow f &= \frac{d_o h_i h_s}{H h_o} \text{mm} \\
 \Rightarrow FOV &= 2 \tan^{-1} \frac{H h_o}{2 d_o h_i} \text{mm}
 \end{aligned}$$