APPENDIX12: Holes on external current leads

$\phi e := 1.75 \cdot in$

$\phi i := 1.62 \cdot in$

$$A := \pi \left[\left(\frac{\phi e}{2} \right)^2 - \left(\frac{\phi i}{2} \right)^2 \right]$$

$A = 2.22 \cdot 10^{-4}\ m^2$ External current lead cross section area

$Ai := 0.54 \cdot cm^2$ Optimizated cross section area

$Ac := A - Ai$

$Ac = 1.68 \cdot 10^{-4}\ m^2$ Cross section area to cut

$x := 10 \cdot mm$

$$\alpha := 2 \cdot \operatorname{asin}\left(\frac{x}{\phi i} \right) \qquad \alpha = 0.491$$

$$\beta := 2 \cdot \operatorname{asin}\left(\frac{x}{\phi e} \right) \qquad \beta = 0.454$$

$$\delta := \frac{\phi e}{2} \cdot \cos\left(\frac{\beta}{2} \right) - \frac{\phi i}{2} \cdot \cos\left(\frac{\alpha}{2} \right) \qquad \delta = 1.698 \cdot 10^{-3}\ m$$

$$\Delta := \frac{\pi}{2 \cdot \pi} \cdot \frac{\phi i^2}{4} \cdot \alpha - \frac{x}{4} \cdot \frac{\phi e}{2} \cdot \cos\left(\frac{\alpha}{2} \right) \qquad \Delta = 5.001 \cdot 10^{-5}\ m^2$$

$$\Lambda := \frac{\pi}{2 \cdot \pi} \cdot \frac{\phi e^2}{4} \cdot \beta - \frac{x}{4} \cdot \frac{\phi e}{2} \cdot \cos\left(\frac{\beta}{2} \right) \qquad \Lambda = 5.795 \cdot 10^{-5}\ m^2$$

$a := \delta \cdot x - \Delta + \Lambda$ Hole cross section area $a = 2.491 \cdot 10^{-5}\ m^2$

I decided to do 8 holes

Given

$$4 \cdot 2 \cdot \operatorname{asin}\left(\frac{x}{\phi i} \right) = \pi$$

Find(x) = 0.016 m

$d := 16\ mm$ Hole diameter

$$Am := 8\cdot\left[\left(\frac{\phi e}{2}\cdot\cos\left(\operatorname{asin}\left(\frac{d}{\phi e}\right)\right)-\frac{\phi i}{2}\cdot\cos\left(\operatorname{asin}\left(\frac{d}{\phi i}\right)\right)\right)\cdot d-\left[\frac{\pi}{4}\cdot\frac{\phi i^{2}}{2\cdot\pi}\cdot\left(2\cdot\operatorname{asin}\left(\frac{d}{\phi i}\right)\right)-\frac{d}{4}\cdot\frac{\phi i}{2}\cdot\cos\left(\frac{2\cdot\operatorname{asin}\left(\frac{d}{\phi i}\right)}{2}\right)\right]+\left[\frac{\pi}{4}\cdot\right.$$

$$Am = 1.147\cdot10^{-4}\ m^{2}$$

$$\alpha := 2\cdot\operatorname{asin}\left(\frac{d}{\phi i}\right)$$

$$\alpha = 0.799$$

$$\alpha 0 := \alpha\cdot\frac{180}{\pi}$$

$$\alpha 0 = 45.765$$

$$L := d\cdot\sqrt{3}$$

$$L = 0.028\ m$$

$$\frac{\phi i^2}{2\,\pi}\cdot\left(2\cdot\operatorname{asin}\left(\frac{d}{\phi e}\right)\right)-\frac{d}{4}\cdot\frac{\phi i}{2}\cdot\cos\left(\frac{2\cdot\operatorname{asin}\left(\frac{d}{\phi e}\right)}{2}\right)\Bigg]\Bigg]$$