**Transformer Magnetic Design**

We set 16 as transformer turns ratio. Maximum input voltage is 400V, input frequency is 100kHz, maximum output current is 8.33A. A core should be selected due to stated specifications. There is no need for energy storing so we decided to use 2 E shape ferrite cores. Firstly, we calculated the area product for required core

We checked E shaped ferrite cores and chose 0R42513EC core since it has the smallest area product which is larger than our minimum criteria. Primary and secondary winding turn numbers are calculated as:

Magnetizing inductance of the transformer is calculated as:

RMS values of output and input currents should be calculated in order to make a cable selection.

RMS value of primary side can be found from the turns ratio.

Required conductor areas can be found with rms values of the currents and predetermined current density.

For secondary side AWG16 satisfies the cross-sectional area but it fails with the frequency, it will work with full skin depth causing large losses. As we include the effect of skin depth, we should use AWG26 according to its maximum frequency for 100% skin depth. AWG26 has a smaller skin depth, so we have to parallel them for the secondary.

The design of transformer is completed. Fill factor is satisfactory. Losses of this transformer should be calculated. Copper losses are calculated as follows.

Core loss is calculated as follows.

The related skin depth analysis for this application can be conducted as:

In this design only AWG26 cable is used. Diameter of this cable is 0.403mm. Therefore, the skin depth exist which is 0.208mm will not create a problem for this design.

**Inductor Magnetic Design**

An output inductor is needed with capability of handling 8.33A and being larger than 160μH. We checked the cores from the smallest one in order to reduce costs and achieved our criterion at 0W41305TC. Calculations are as follows:



