Transformer computing within DriveSize

DriveSize will select a transformer based on base loads of motors but you must use your application knowledge to verify the selection is based on relevant inputs.
You may let DriveSize to select a transformer if motor(s) and drive(s) selections are done already. Transformer load is then calculated from all supply unit types (DSU, TSU, ISU) or from single drives. But you may override values computed by DriveSize by typing in the correct transformer load(s) as required fundamental power.

Transformers types are: Dry and Oil-immersed. With “Auto selection” anyway Dry is preferred. The winding number of transformer has to match the pulse number of drive or supply units.

Windings	pulse #
2	6
3	12

DriveSize will compute and show the sinusoidal apparent power from base loads assuming they are present concurrently. It is called “**Fundamental power”** and divided in two parts DSU/TSU load and ISU load if present.

The following equations are used to compute fundamental powers. The first part collects the sum of positive powers and adds the losses of DSU/TSU/ISU. Basically this can be computed from positive motor base powers considering losses and considering number of motors and number of inverters. The second part of equation takes care of big single negative powers.
Fundamental power for DSU load and ISU loads individually:

$$S_{load\_DSU} = 1.05 \cdot \max\left(\sum\left(\frac{P_{cont,mot,LSU} + P_{loss,LSU}}{\cos\varphi}\right), \frac{\left|P_{cont,gen\_mostnegative}\right|}{\cos\varphi}\right)$$

$$S_{load\_ISU} = 1.05 \cdot \max\left(\sum\left(\frac{P_{cont,mot,ISU} + P_{loss,ISU}}{\cos\varphi}\right), \frac{\left|P_{cont,gen\_mostnegative}\right|}{\cos\varphi}\right)$$

The cosφ values are
DSU cosφ=0.98
TSUs cosφ = minimum value of 0.98 and MotorVoltage/Secondary voltage
4Q and ISUs cosφ = 1.

Then the total fundamental power is computed.

$$S_{load} = S_{load\_DSU} + S_{load\_ISU}$$

And then an auxiliary variableα, which together with different harmonics pattern will determine the derating of transformer.

$a = \min\left(\frac{0.04 * S_{load}(kVA)}{U_{\sec.voltage}(V)}, 0.2\right)$, this will have values between 0.02…0.2

If there is DSU/TSU supply units then for DSU/TSU load

$kDSU = \sqrt{\frac{1+a}{1.11+a*4}}$, this will vary between 0.926….0.79

If there are 4Q ISU supplies then for ISU load

$kISU = \sqrt{\frac{1+a}{1.01+a*1{,}12}}$, this will vary between 0.99….0.9860

The final derating divider is computed based on weights of loads

$$k = \frac{kDSU * S_{load\_DSU} + kISU * S_{load\_ISU}}{Sload}$$

Finally proposed transformer nominal power has to meet following criteria.

$$S_n \geq \frac{S_{load}}{k}$$

Selection criteria's are that nominal frequency, winding number match, Secondary Voltage and Primary voltage are high enough. DriveSize will refuse to select transformer if DSU/TSU/ISU are representing different pulse numbers.

The ambient derating for transformers is considered too.