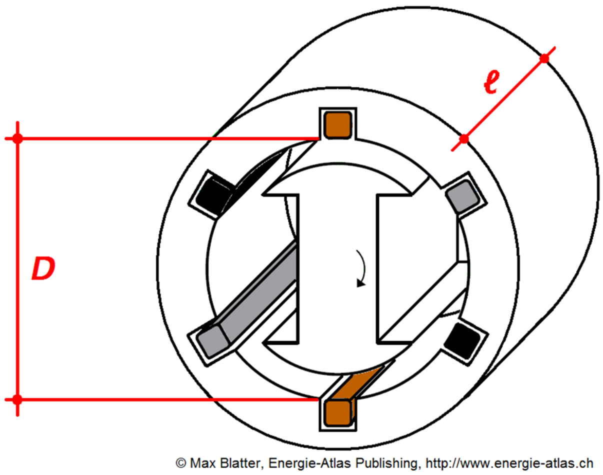
Power capacity of electric machines in dependence of their physical size

Rotating machines



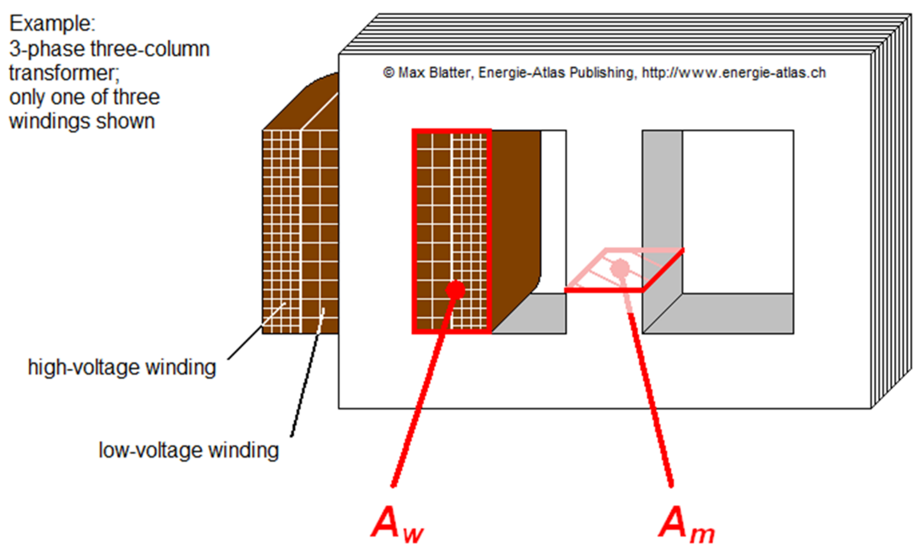
$S = C \cdot n \cdot D^2 \cdot \ell$

S:	*Apparent power of the machine in* VA
C:	*Utilization factor in* (VA·s)/m³
n:	*Rotational speed in* s^{-1}
D:	*Bore diameter according to the figure in* m
ℓ:	*Armature length according to the figure in* m

Power is

- proportional to the speed
- proportional to the 3rd power of the linear dimension, i.e. proportional to the volume

Transformers



$S = C \cdot f \cdot A_w \cdot A_m$

S:	*Apparent power of the transformer in* VA
C:	*Utilization factor in* VA/(Hz·m⁴)
f:	*Frequency in* Hz
A_w:	*Cross-sectional area of the windings according to the figure in* m²
A_m:	*Cross-sectional area of the magnetic core according to the figure in* m²

Power is

- proportional to the frequency
- proportional to the 4th power of the linear dimension, i.e. proportional to $(\text{volume})^{4/3}$