Technical Data Summary, TKD type Low speed direct drive generator

Reference data (referred to ambient 30 C, copper 130 C - forced air cooling

Generator code MotorCode = "U3 1340F.15.3 G - R1"

DocNum = "preliminary - offer purpose only"

Output power, cont. duty S1, wn2, coil at 130 C	$Pout(Itherm(wn2), wn2) = 72.4 \cdot kW$
Rated speed	$wn2 = 1.5 \times 10^3 \cdot rpm$
Max speed	$wn3 = 2 \times 10^3 \cdot rpm$
Generator constant	$Mcst = 13.0951 \cdot N \cdot \frac{m}{\sqrt{watt}}$
Breakover torque in short circuit	$Cul = 1.1084 \times 10^3 \cdot N \cdot m$

Physical data:

Maximum mechanical speed	$Wmax := 3000 \cdot rpm$
Rotor inertia, magnet ring	$Jrot = 0.0654\, m^2 \cdot kg$
Max. shock on Generator, any direction	$Shk := 2 \cdot g$
Max. vibration level on Generator, any direction	$Vlevel := 2 \cdot g$
Outer diameter	$Dstin = 248 \cdot mm$
Stator mass, active part	$Mstat = 111.8261\, kg$
Airgap, mechanical,	$Agap = 0.6 \cdot mm$
Maximum inner rotor diameter	$Diamin = 106.0369 \cdot mm$
Outer rotor diameter	$Diamax = 340 \cdot mm$
Stack radial length	$\frac{Stk1}{2} = 200 \cdot mm$
Insulation class	Class H
Cooling	$Cooling_{Coolindex} = "Forced\ air"$
Magnet mass	$Mmag = 4.3361 \cdot kg$
Total mass, active part only	$Mtotal = 129.9586\, kg$

Thermal data:

Generator max loss at wn2	$Loss(Imnominale, wn2) = 3.3007 \cdot kW$
Thermal impedance, copper to air over frame, 1 m/sec	$Rth = 0.0306 \cdot K \cdot watt^{-1}$
Thermal capacity	$Cth = 4.6967 \times 10^{4} \cdot joule \cdot K^{-1}$
Thermal time constant	$ta = 1437\,s$
Treshold of built-in PTC	$PTCt := 130 \cdot K$
Coolant flow (water) (temp. rise=10K)	Fl = "N.A."
Temp. rise in coolant	N.A.
Max. coolant inlet temperature	$Intemp := 30$ C

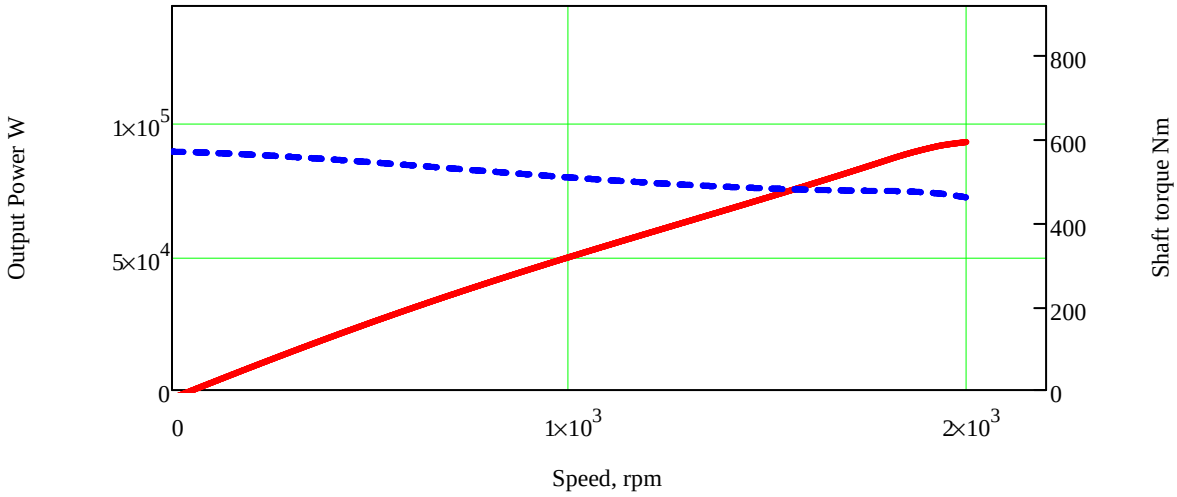
Electrical data:

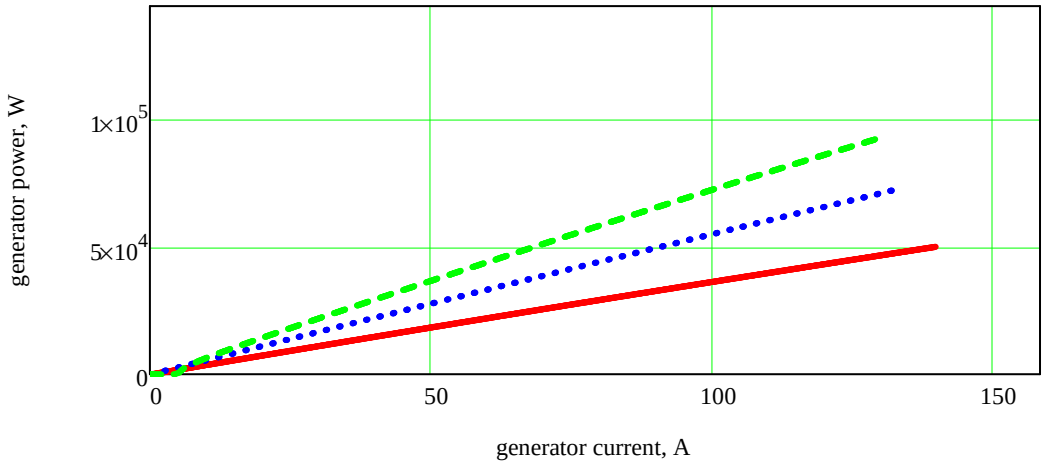
Pole number	$Pn = 8$
Connection	Wye
Rated voltage	$\lvert Vgen(Itherm(wn2), wn2) \rvert \cdot \sqrt{3} = 350.7 \cdot volt$
Rated current	$Itherm(wn2) = 133 \cdot amp$
Back EMF between phases, tol +/-7%, 20C	$EMF = 2.2 \cdot volt \cdot sec$
Torque constant	$Kt = 3.8 \cdot N \cdot m \cdot amp^{-1}$
Temperature coefficient of back EMF and Kt	Dke/Dt = -0.11%/K
Winding resistance, 20 C	$Rw = 0.0556 \cdot ohm$
Winding inductance	$Lc = 2.1375 \cdot mH$
Frequency at wn	$Fn = 100 \cdot Hz$
Min. demagnetization current, 125 C	$Ipk = 256.5296 \cdot amp$
Efficiency at rated power	$Eff(Itherm(wn2), wn2) = 0.9561$

Nominal (design) data at operating point 1

Speed	$wn2 = 1500 \cdot rpm$
Nominal power	$Pnominale = 72 \cdot kW$
Nominal current	$Imnominale = 131.9 \cdot amp$
Nominal voltage	$Vgennom = 350.4 \cdot volt$
Nominal power factor	$Cosfinom = 0.899$
Nominal efficiency	$Effnom = 0.956$
Direct current	$Idnom = 0 \cdot amp$
Quadrature current	$Iqnom = 131.9497 \cdot amp$

Maximum generator electric output power (W) and shaft torque (Nm) versus speed (rad/sec), 100 K DT, ambient 40C, electric loss only (frameless generator), sinusoidal current control, Id=0





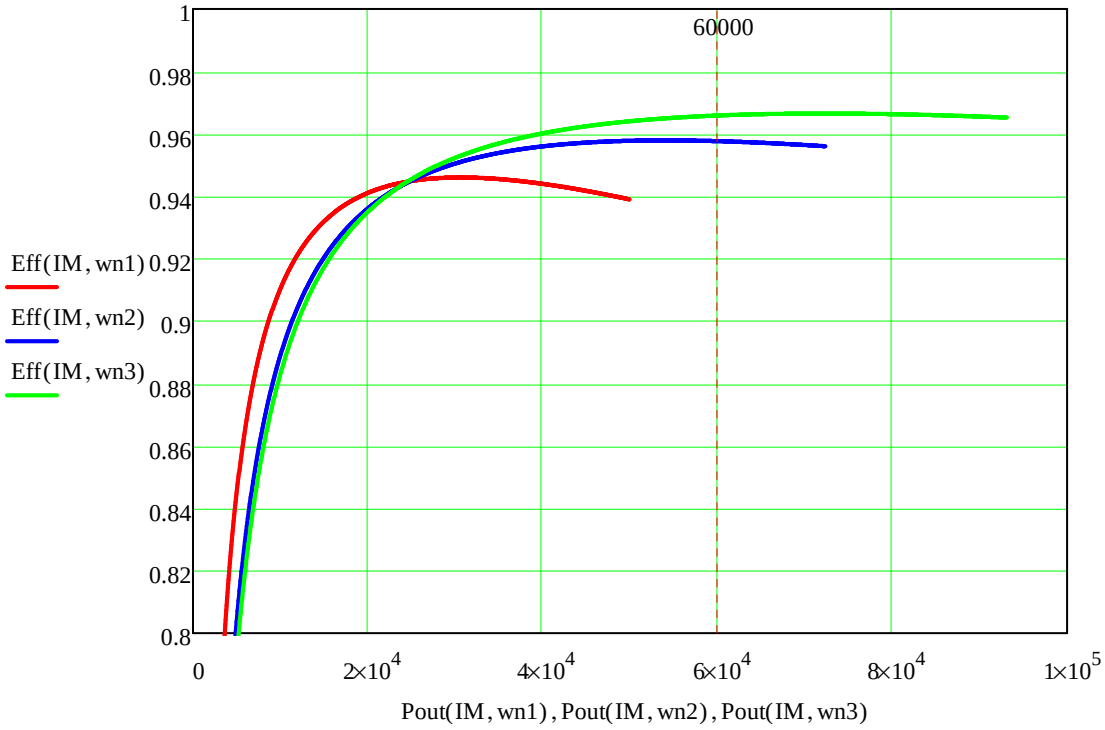
Generator power (W) versus current at wn1,2,3 speeds, sinusoidal current control, Id=0

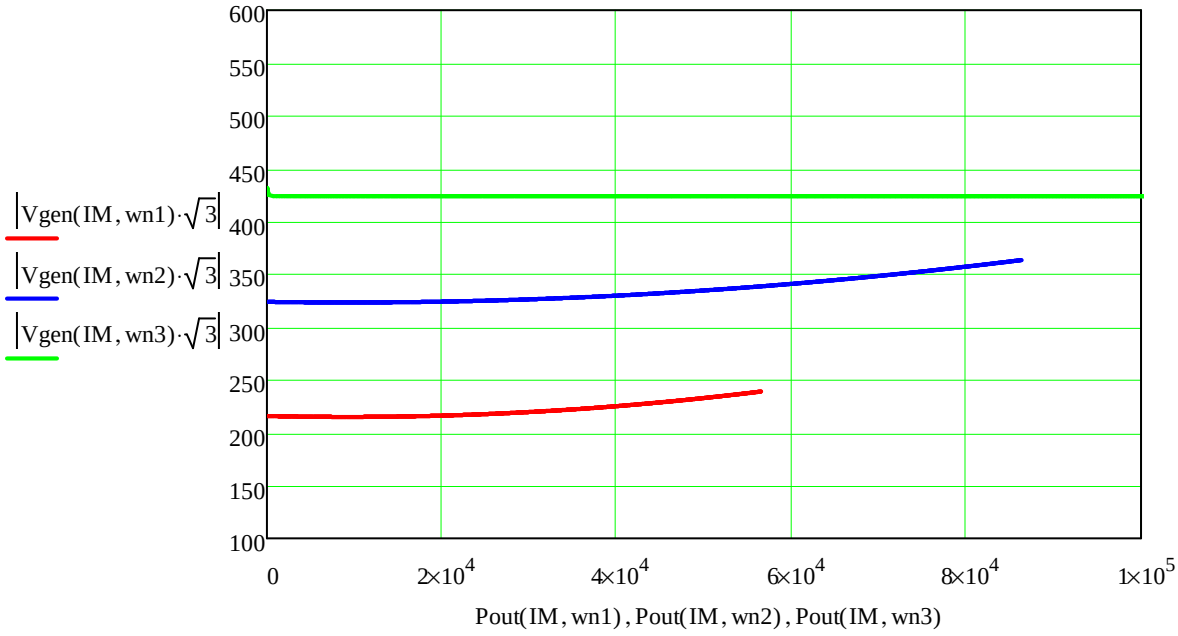
Dati di targa - nameplate data

Nominal speed	$wn2 = 1.5 \times 10^3 \cdot rpm$	MotorCode = "U3 1340F.15.3 G - R1"	
Shaft torque	$Tgen(wn2) = 481.9121 \cdot N \cdot m$	Pole Number	$Pn = 8$
Rated voltage	$\lvert Vgen(Itherm(wn2), wn2) \rvert \cdot \sqrt{3} = 351 \cdot volt$	EMF voltage	$EMF = 2.184 \cdot V \cdot s$
Rated current	$Itherm(wn2) = 133 \cdot amp$	Rated output power	$Pout(Itherm(wn2), wn2) = 72.38 \cdot kW$

Efficiency vs. output power at wn1,2,3 rpm, converter load (sinusoidal Id control)

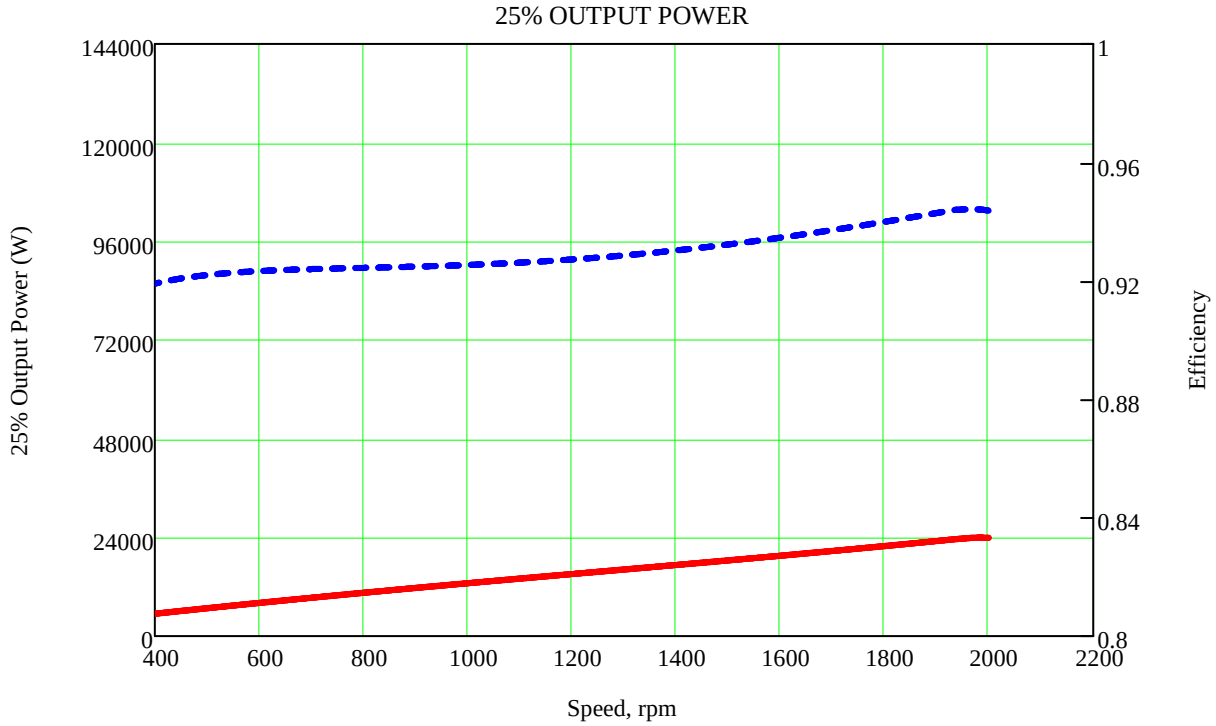
wn1 ≡ 1000·rpm wn2 ≡ 1500·rpm wn3 ≡ 2000·rpm

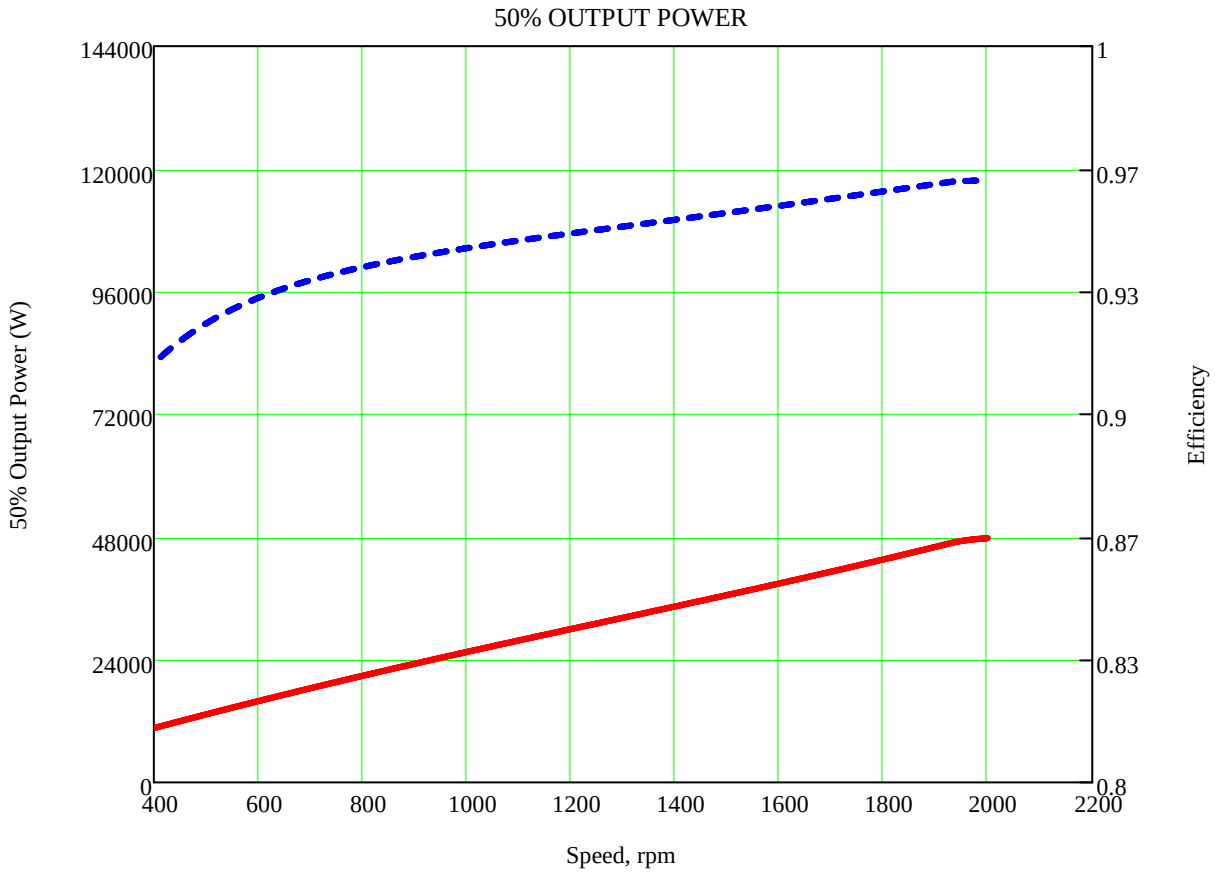


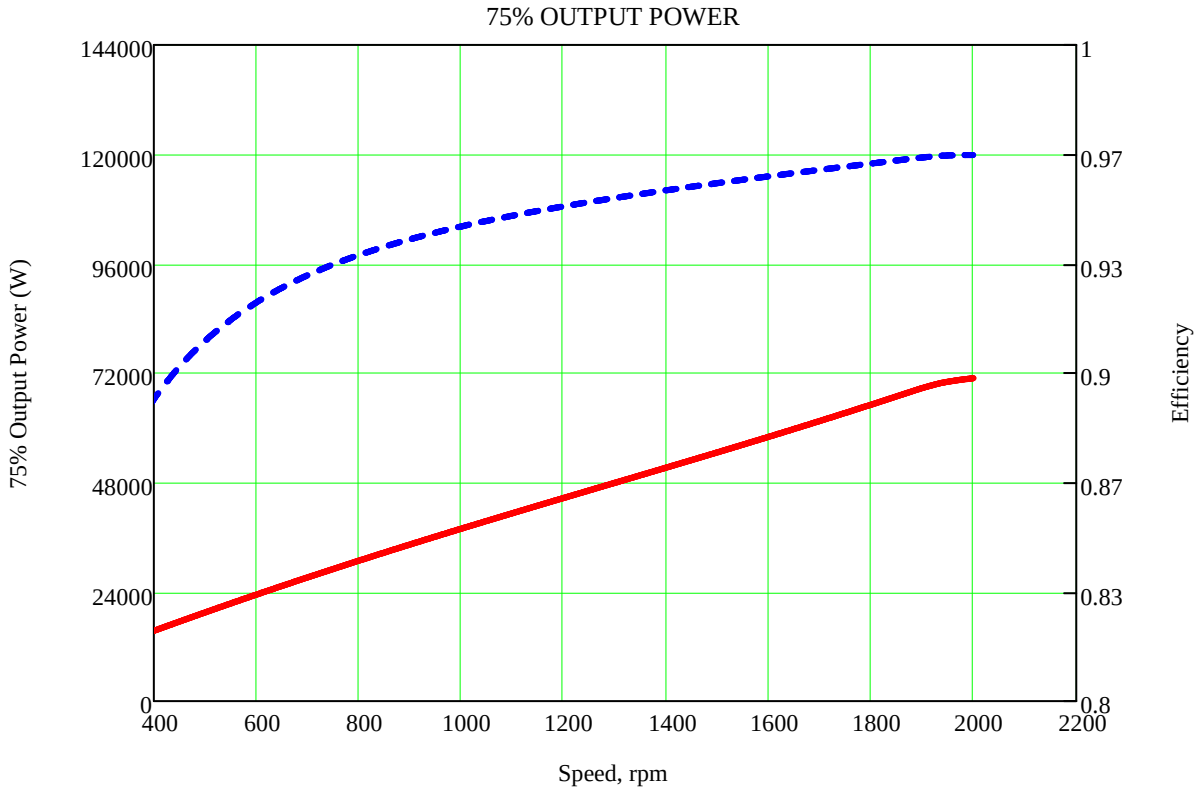


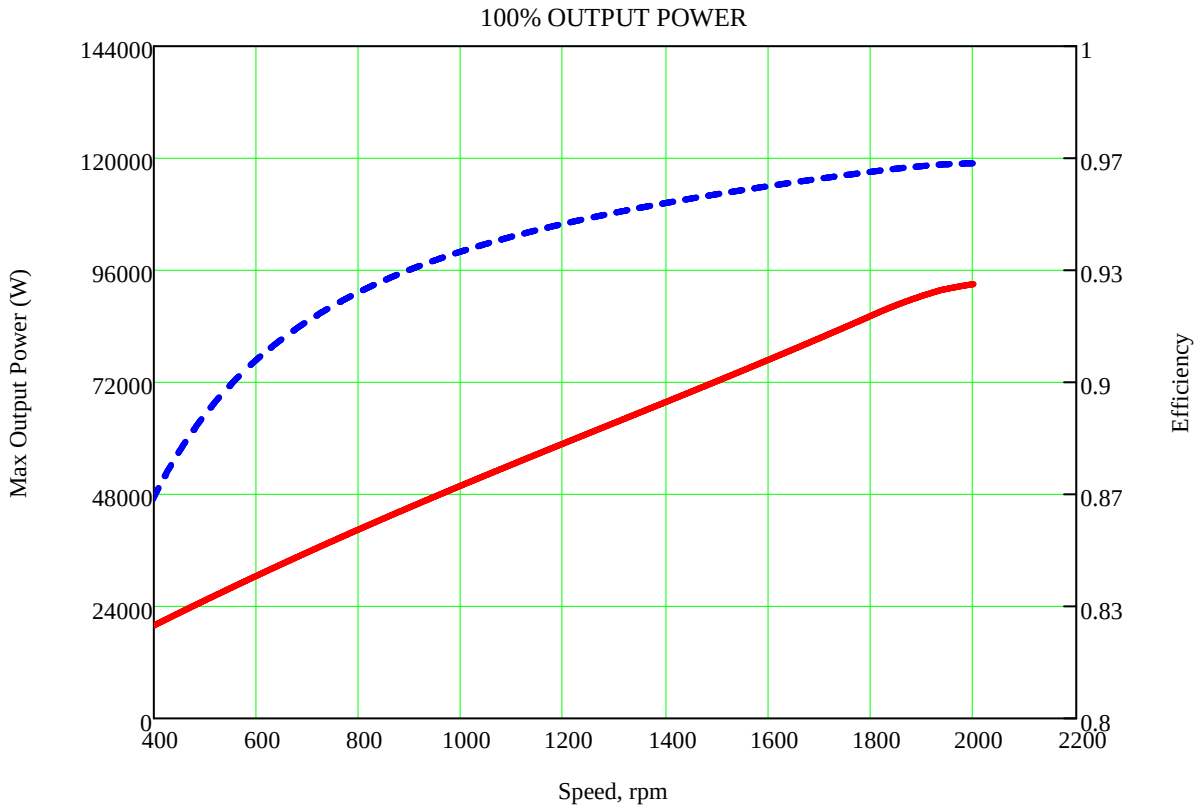
generator voltage versus output power at wn1,2,3 speeds; sinusoidal current control, Id=0, max temperature (add ~ 8% more voltage at low temperature)

generator output power and efficeincy at different load values






75% OUTPUT POWER
144000
120000
96000
72000
48000
24000
0
1
0.97
0.93
0.9
0.87
0.83
0.8
400
600
800
1000
1200
1400
1600
1800
2000
2200
75% Output Power (W)
Efficiency
Speed, rpm


100% OUTPUT POWER
144000
120000
96000
72000
48000
24000
0
1
0.97
0.93
0.9
0.87
0.83
0.8
400
600
800
1000
1200
1400
1600
1800
2000
2200
Max Output Power (W)
Efficiency
Speed, rpm