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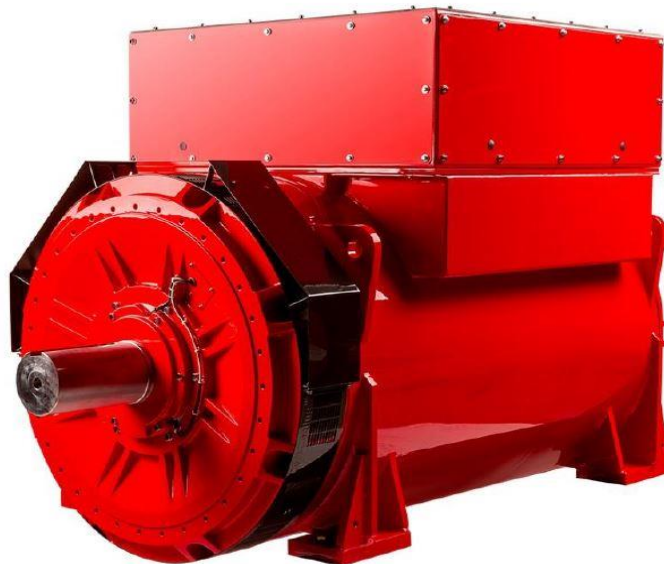
S9L1D-G4 Wdg.312 - Technical Data Sheet

Standards

STAMFORD industrial alternators meet the requirements of the relevant parts of the IEC 60034 and the relevant sections of other international standards such as BS5000-3, ISO 8528-3, VDE 0530, NEMA MG1-32, CSA C22.2-100 and AS 60034. Other standards and certifications can be considered on request.

Quality Assurance

Alternators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.



Excitation and Voltage Regulators

Excitation System					
AVR Type	DM110	DECS100	DECS150		
Voltage Regulation	± 0.25%	± 0.25%	± 0.25%		with 4% Engine Governing
AVR Power	PMG	PMG	PMG		

No Load Excitation Voltage (V)	12.8 - 11.4
No Load Excitation Current (A)	1.1 - 1
Full Load Excitation Voltage (V)	47
Full Load Excitation Current (A)	3.9
Exciter Time Constant (seconds)	0.34

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Electrical Data								
Insulation System	H							
Stator Winding	Double Layer Concentric							
Winding Pitch	2/3							
Winding Leads	6							
Winding Number	312							
Number of Poles	4							
IP Rating	IP23							
RFI Suppression	BS EN 61000-6-2 & BS EN 61000-6-4, VDE 0875G, VDE 0875N. Refer to factory for others							
Waveform Distortion	NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
Short Circuit Ratio	1/Xd							
Steady State X/R Ratio	29.45							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	2.78 m³/sec				3.33 m³/sec			
Voltage Star (V)	380	400	415	440	416	440	460	480
Voltage Parallel Star (V)	-	-	-	-	-	-	-	-
Voltage Delta (V)	-	-	-	-	-	-	-	-
kVA Base Rating (Class H) for Reactance Values (kVA)	4035	4250	4250	3900	4419	4675	4887	5100
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.136	2.030	1.886	1.540	2.342	2.215	2.118	2.030
X'd Dir. Axis Transient	0.209	0.199	0.185	0.151	0.229	0.217	0.207	0.199
X''d Dir. Axis Subtransient	0.117	0.112	0.104	0.085	0.129	0.122	0.116	0.112
Xq Quad. Axis Reactance	1.183	1.125	1.045	0.853	1.298	1.227	1.174	1.125
X''q Quad. Axis Subtransient	0.134	0.127	0.118	0.096	0.147	0.139	0.133	0.127
XL Stator Leakage Reactance	0.062	0.059	0.055	0.045	0.068	0.064	0.062	0.059
X2 Negative Sequence Reactance	0.183	0.174	0.161	0.132	0.200	0.189	0.181	0.174
X0 Zero Sequence Reactance	0.066	0.063	0.058	0.048	0.072	0.068	0.065	0.063
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.563	2.436	2.263	1.847	2.810	2.657	2.542	2.436
X'd Dir. Axis Transient	0.240	0.228	0.212	0.173	0.263	0.249	0.238	0.228
X''d Dir. Axis Subtransient	0.137	0.131	0.121	0.099	0.151	0.142	0.136	0.131
Xq Quad. Axis Reactance	1.219	1.159	1.076	0.879	1.337	1.264	1.209	1.159
X''q Quad. Axis Subtransient	0.160	0.152	0.142	0.116	0.176	0.166	0.159	0.152
XL Stator Leakage Reactance	0.070	0.067	0.062	0.051	0.077	0.073	0.070	0.067
Xlr Rotor Leakage Reactance	0.070	0.067	0.062	0.051	0.077	0.073	0.070	0.067
X2 Negative Sequence Reactance	0.219	0.208	0.194	0.158	0.240	0.227	0.217	0.208
X0 Zero Sequence Reactance	0.077	0.073	0.068	0.056	0.085	0.080	0.076	0.073

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Time Constants (Seconds)		
T'd Transient Time Const.	0.372	
T''d Sub-Transient Time Const.	0.017	
T'do O.C. Field Time Const.	4.175	
Ta Armature Time Const.	0.026	
T''q Sub-Transient Time Const.	0.011	
Resistances in Ohms (Ω) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	0.0002306	
Rotor Winding Resistance (Rf)	0.829	
Exciter Stator Winding Resistance	11.2	
Exciter Rotor Winding Resistance per phase	0.016	
PMG Phase Resistance (Rpmg) per phase	1.91	
Positive Sequence Resistance (R1)	0.00029	
Negative Sequence Resistance (R2)	0.00033	
Zero Sequence Resistance (R0)	0.00029	
Saturation Factors	400V	480V
SG1.0	0.239	0.239
SG1.2	1.126	1.135
Mechanical Data		
Shaft and Keys	All alternator rotors are dynamically balanced to better than ISO 21940-11 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.	
	1 Bearing	2 Bearing
SAE Adaptor		00, None
Moment of Inertia	-	130.1 kgm ²
Weight Wound Stator	-	4193kg
Weight Wound Rotor	-	2931kg
Weight Complete Alternator	-	8250kg
Shipping weight in a Crate	-	8686kg
Packing Crate Size	-	300 x 200 x 220(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	NU1036
Bearing Non-Drive End	-	6328

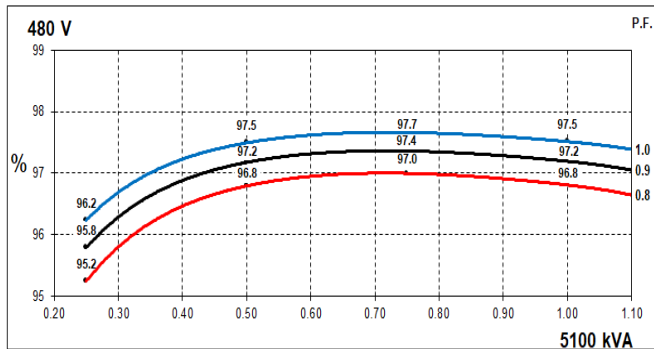
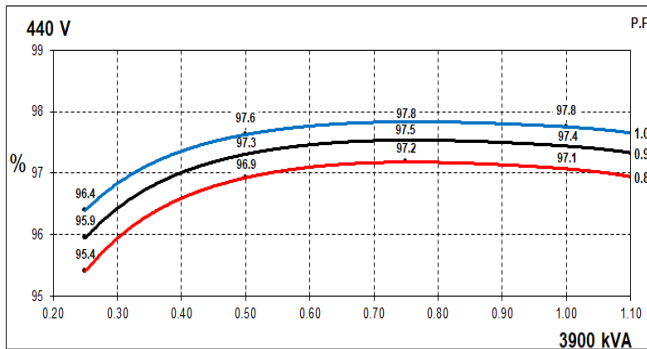
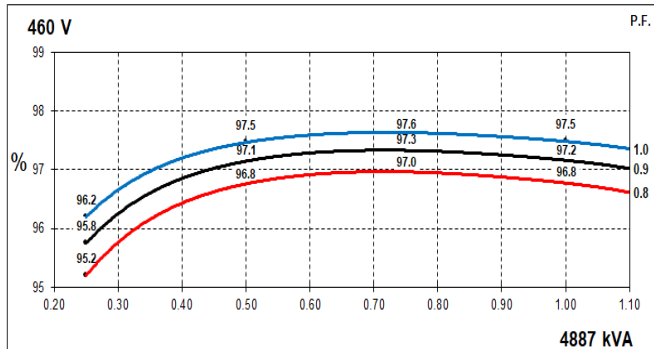
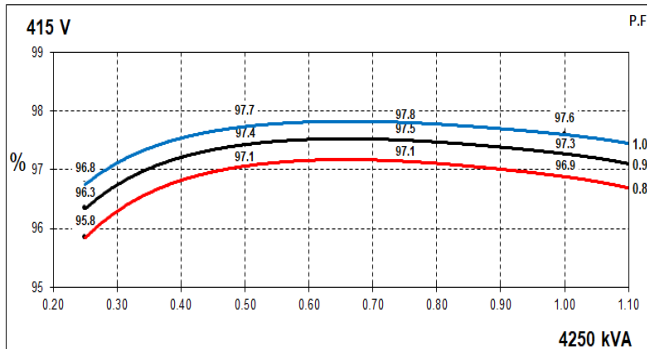
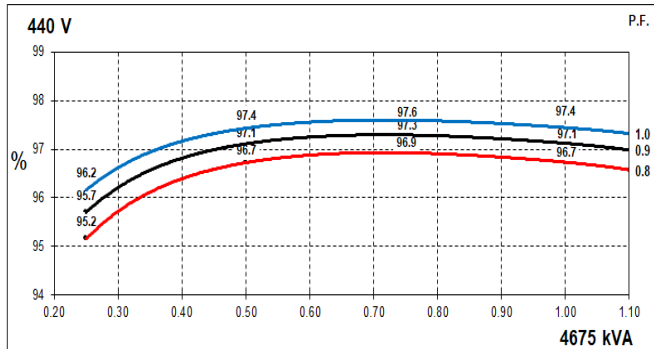
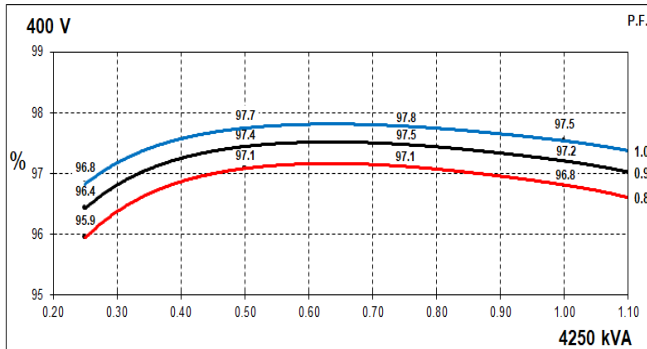
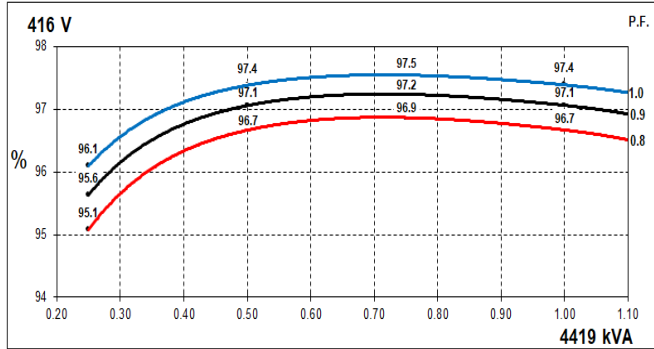
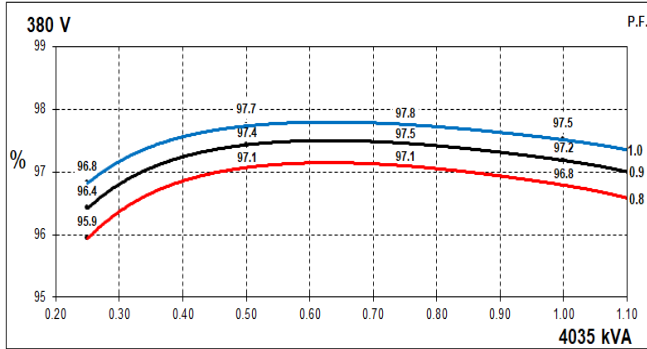
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THREE PHASE EFFICIENCY CURVES

50Hz

60Hz

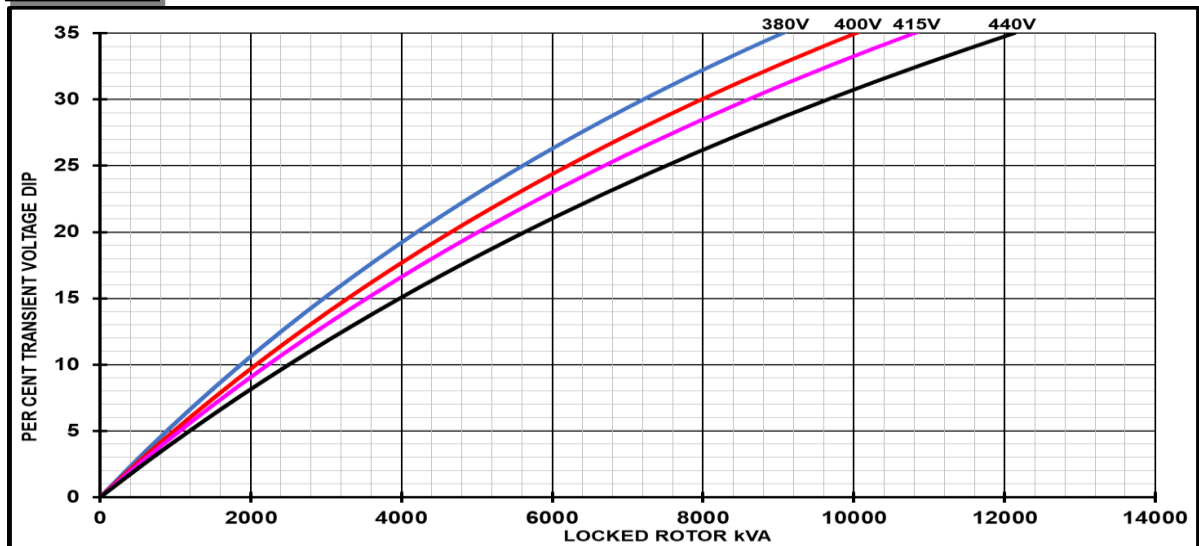


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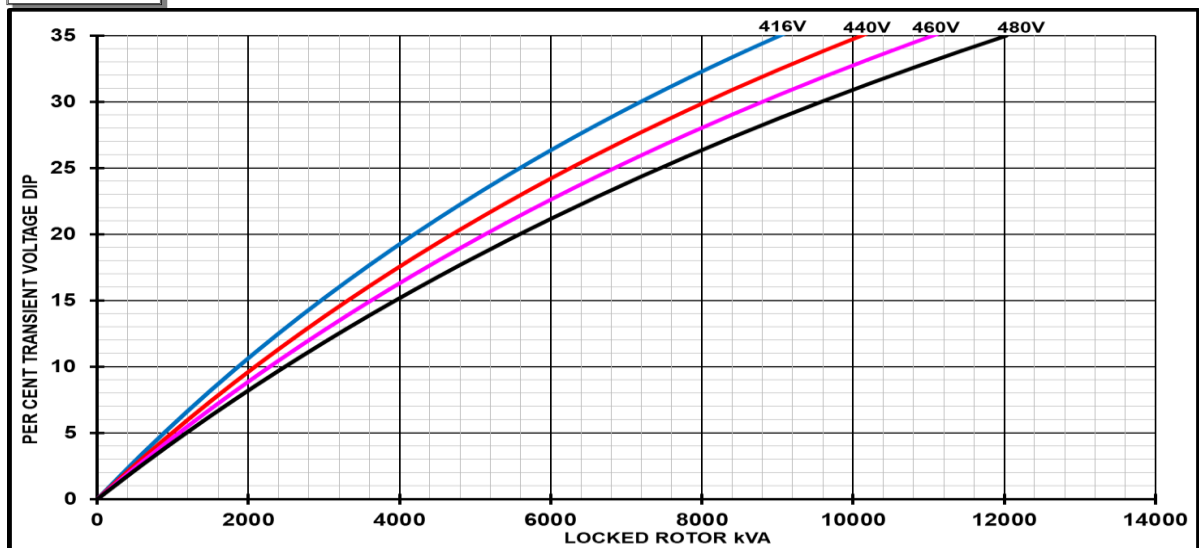
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Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor	Lagging PF	Scaling Factor
<= 0.4	1.00	<= 0.4	1.25
0.5	0.95	0.5	1.20
0.6	0.90	0.6	1.15
0.7	0.86	0.7	1.10
0.8	0.83	> 0.7	1.00
0.9	0.75		
0.95	0.70		
1	0.65		

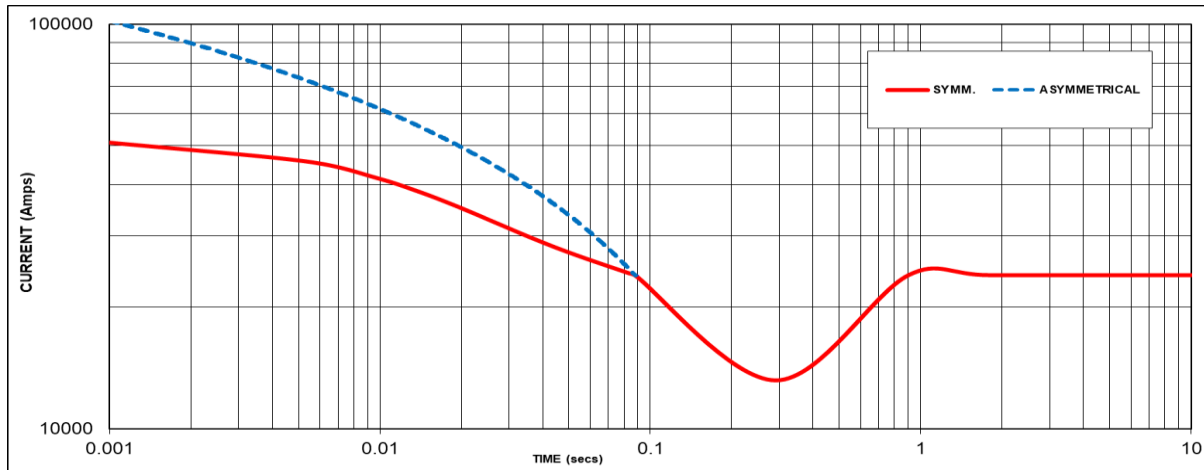
Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

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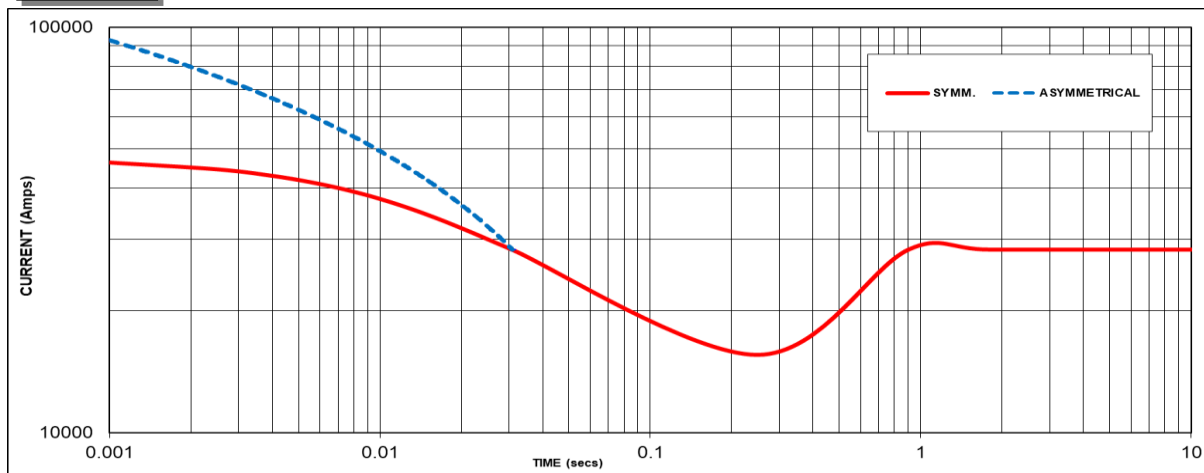
Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz



Sustained Short Circuit = 23943 Amps

60Hz



Sustained Short Circuit = 28292 Amps

Note 1

The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380V	X 1.00	416V	X 1.00
400V	X 1.05	440V	X 1.06
415V	X 1.09	460V	X 1.11
440V	X 1.16	480V	X 1.15

The sustained current value is constant irrespective of voltage level

Note 2

The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

	3-phase	2-phase L-L	1-phase L-N
Instantaneous	x 1.00	x 0.87	x 1.30
Minimum	x 1.00	x 1.80	x 3.20
Sustained	x 1.00	x 1.50	x 2.50
Max. sustained duration	10 sec.	5 sec.	2 sec.

Note 3

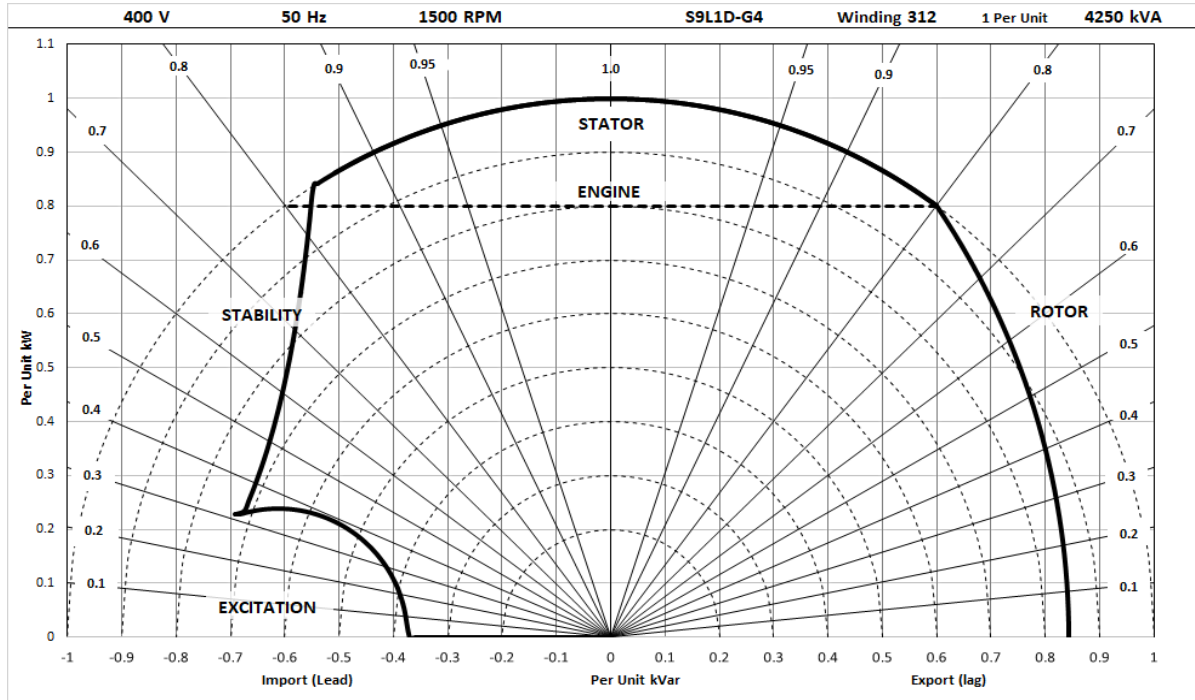
All other times are unchanged
 Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :
 Parallel Star = Curve current value X 2
 Series Delta = Curve current value X 1.732

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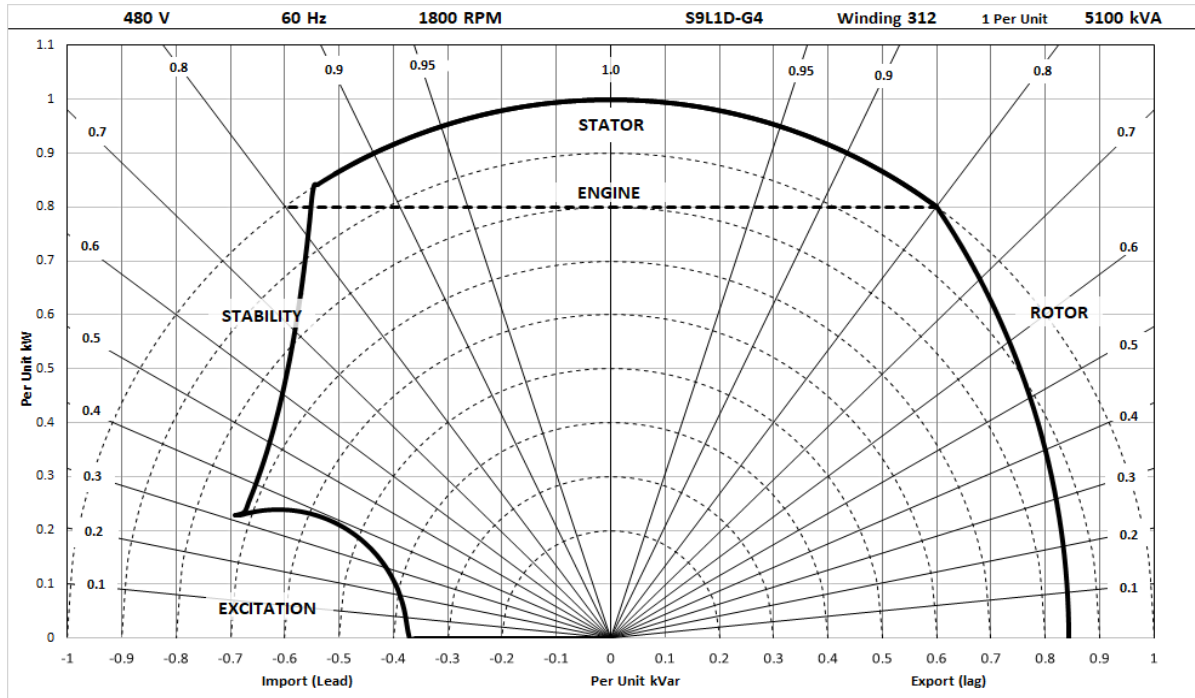
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Typical Alternator Operating Charts

400V/50Hz



480V/60Hz



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RATINGS AT 0.8 POWER FACTOR

Class - Temp Rise		Standby - 150/40°C				Cont. H - 125/40°C				Cont. F - 105/40°C				Cont. B - 80/40°C			
50 Hz	Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	kVA	4175	4400	4400	4040	4035	4250	4250	3900	3710	3910	3910	3590	3230	3400	3400	3120
	kW	3340	3520	3520	3232	3228	3400	3400	3120	2968	3128	3128	2872	2584	2720	2720	2496
	Efficiency (%)	96.7	96.7	96.8	97.0	96.8	96.8	96.9	97.1	96.9	96.9	97.0	97.1	97.1	97.1	97.1	97.2
	kW Input	3453	3638	3635	3331	3335	3512	3509	3214	3062	3227	3225	2957	2662	2802	2801	2568

60 Hz	Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	kVA	4575	4838	5062	5275	4419	4675	4887	5100	4063	4300	4494	4688	3531	3738	3906	4075
	kW	3660	3870	4050	4220	3535	3740	3910	4080	3250	3440	3595	3750	2825	2990	3125	3260
	Efficiency (%)	96.6	96.7	96.7	96.8	96.7	96.7	96.8	96.8	96.8	96.8	96.9	96.9	96.8	96.9	97.0	97.0
	kW Input	3788	4003	4187	4361	3657	3866	4040	4214	3359	3553	3711	3870	2917	3086	3223	3361

De-rates

All values tabulated above are subject to the following reductions:

- 5% when air inlet filters are fitted
- 3% for every 500 meters by which the operating altitude exceeds 1000 meters above mean sea level
- 3% for every 5°C by which the operational ambient temperature exceeds 40°C @ Class H temperature rise (please refer to applications for ambient temperature de-rates at other temperature rise classes)
- For marine alternators, 3% for every 5°C by which the operational ambient temperature exceeds 50°C
- For any other operating conditions impacting the cooling circuit please refer to applications

Note: Requirement for operating in an ambient exceeding 60°C and altitude exceeding 4000 meters (for <690V) or 1500 meters (for >690V) must be referred to applications.

Dimensional and Torsional Drawing

For dimensional and torsional information please refer to the alternator General Arrangement and rotor drawings available on our website (<http://stamford-avk.com/>)

Note: Continuous development of our products means that the information contained in our data sheets can change without notice, and specifications should always be confirmed with Cummins Generator Technologies prior to purchase.



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