

STAMFORD

S4L1S-F Wdg.311 (Single Phase) - Technical Data Sheet

Standards

Stamford industrial alternators meet the requirements of IEC EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100 and AS1359. 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	AS440	MX341	MX321		
Voltage Regulation	± 1%	± 1%	± 0.5%		with 4% Engine Governing
Excitation Type	Self-Excited	PMG	PMG		

No Load Excitation Voltage (V)	12 - 9
No Load Excitation Current (A)	0.7 - 0.5
Full Load Excitation Voltage (V)	41 - 37.5
Full Load Excitation Current (A)	2.3 - 2.1
Exciter Time Constant (seconds)	0.105

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S4L1S-F Wdg.311 (Single Phase)

Electrical Data						
Insulation System	Class H					
IP Rating	IP23					
Stator Winding	Double Layer Concentric					
Winding Pitch	2/3					
Winding Leads	12					
Winding Number	311					
Number of Poles	4					
RFI Suppression	EN 61000-6-2 & EN 61000-6-4, refer to factory for others					
Waveform Distortion	NO LOAD < 2.5% NON-DISTORTING LINEAR LOAD < 5.0%					
Short Circuit Ratio	1/Xd					
Steady State X/R Ratio	14.76					
	50Hz			60Hz		
VOLTAGE DOUBLE DELTA	220 / 110	230 / 115	240 / 120	220 / 110	230 / 115	240 / 120
VOLTAGE PARALLEL DELTA	110	115	120	110	115	120
POWER FACTOR	0.8	0.8	0.8	0.8	0.8	0.8
KVA BASE RATING FOR REACTANCE VALUES	200	200	200	210	220	230
Saturated Values in Per Unit at Base Ratings and Voltages						
Xd Dir. Axis Synchronous	2.02	1.85	1.70	2.55	2.44	2.34
X'd Dir. Axis Transient	0.13	0.12	0.11	0.17	0.16	0.15
X''d Dir. Axis Subtransient	0.10	0.09	0.08	0.12	0.12	0.11
Xq Quad. Axis Reactance	1.75	1.60	1.47	2.20	2.11	2.03
X''q Quad. Axis Subtransient	0.23	0.21	0.19	0.29	0.28	0.27
Xl Leakage Reactance	0.04	0.04	0.04	0.06	0.05	0.05
X2 Negative Reactance	0.16	0.15	0.14	0.21	0.20	0.19
X0 Zero Sequence	0.07	0.06	0.06	0.08	0.08	0.08
Unaturated Values in Per Unit at Base Ratings and Voltages						
Xd Dir. Axis Synchronous	2.43	2.22	2.04	3.06	2.93	2.81
X'd Dir. Axis Transient	0.15	0.14	0.13	0.19	0.18	0.17
X''d Dir. Axis Subtransient	0.12	0.11	0.10	0.15	0.14	0.13
Xq Quad. Axis Reactance	1.80	1.65	1.51	2.27	2.18	2.09
X''q Quad. Axis Subtransient	0.28	0.25	0.23	0.35	0.33	0.32
Xl Leakage Reactance	0.05	0.05	0.04	0.06	0.06	0.06
X2 Negative Reactance	0.20	0.18	0.17	0.25	0.24	0.23
X0 Zero Sequence	0.08	0.07	0.06	0.10	0.09	0.09
Time Constants (seconds)						
T'd TRANSIENT TIME CONST.	0.08					
T''d SUB-TRANSTIME CONST.	0.019					
T'do O.C. FIELD TIME CONST.	1.7					
Ta ARMATURE TIME CONST.	0.018					

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S4L1S-F Wdg.311 (Single Phase)

Resistances in Ohms (Ω) at 22°C		
Stator Winding Resistance (Ra) per phase series star connected	0.005	
Rotor Winding Resistance (Rf)	1.37	
Exciter Stator Winding Resistance	18	
Exciter Rotor Winding Resistance per phase	0.068	
Positive Sequence Resistance (R1)	0.009125	
Negative Sequence Resistance (R2)	0.010512	
Zero Sequence Resistance (R0)	0.009125	
PMG Phase Resistance (Rpmg) per phase	1.9	
Mechanical data		
Cooling Air	0.76 m ³ /sec (50Hz)	0.92 m ³ /sec (60Hz)
Shaft and Keys	All alternator rotors are dynamically balanced to better than BS6861: Part 1 Grade 2.5 for minimum vibration in operation.	
Bearing	Single Bearing	Double Bearing
Weight Complete Alternator	1160 kg	1160 kg
Weight Wound Stator	535 kg	535 kg
Weight Wound Rotor	463 kg	440 kg
Moment of Inertia	5.4292 kgm ²	5.2304 kgm ²
Shipping weight in a Crate	1230 kg	1230 kg
Packing Crate Size	155 x 87 x 107 (cm)	155 x 87 x 107 (cm)
Maximum Over Speed	2250 RPM for two minutes	2250 RPM for two minutes
Bearing Drive End	N/A	Ball Bearing, 6317
Bearing Non-Drive End	Ball Bearing, 6314	

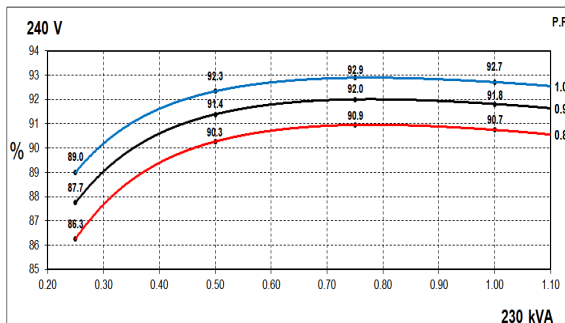
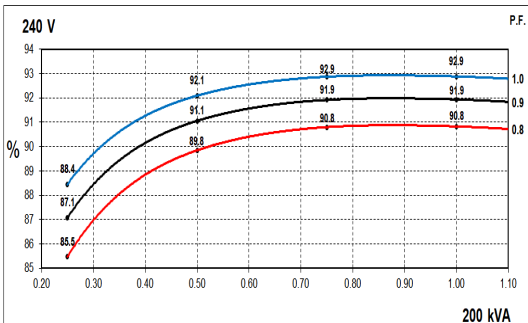
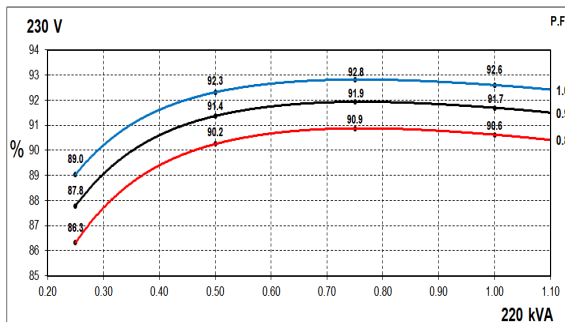
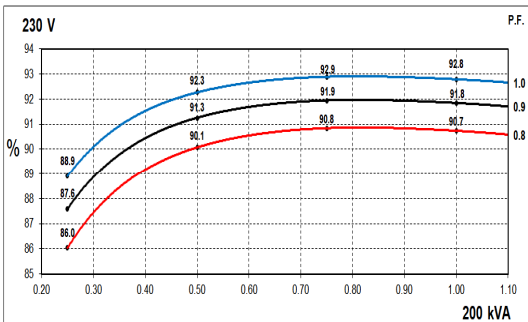
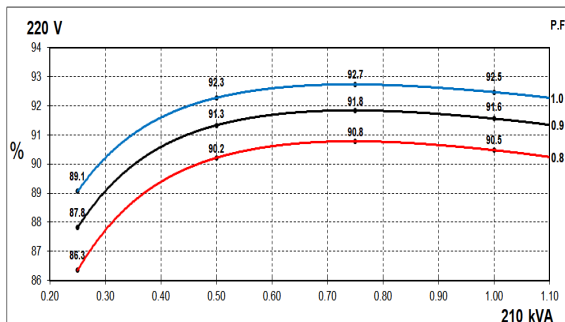
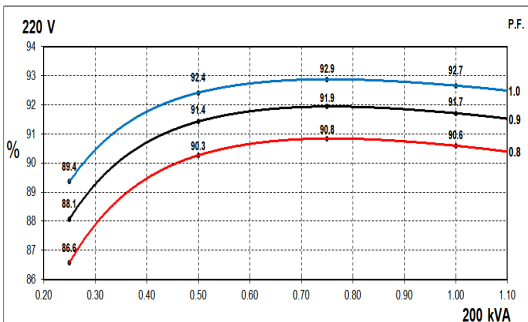
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Double Delta Efficiency Curves with 0.8PF

50Hz Curves

60Hz Curves

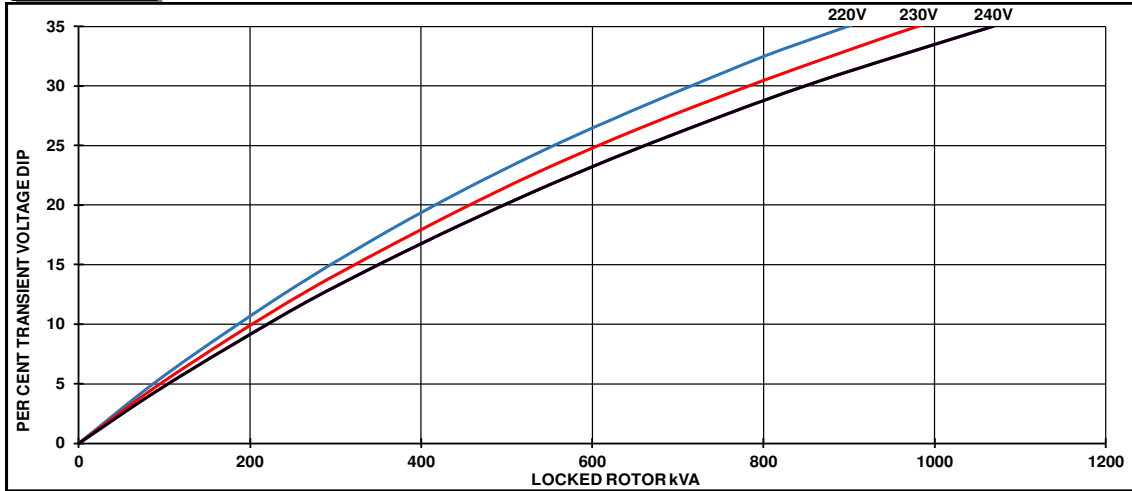


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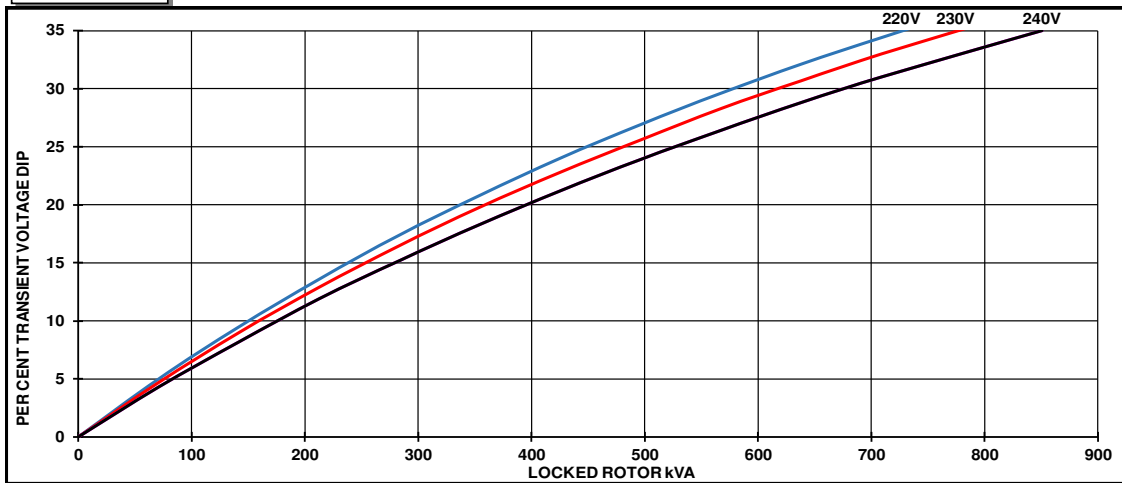
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Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



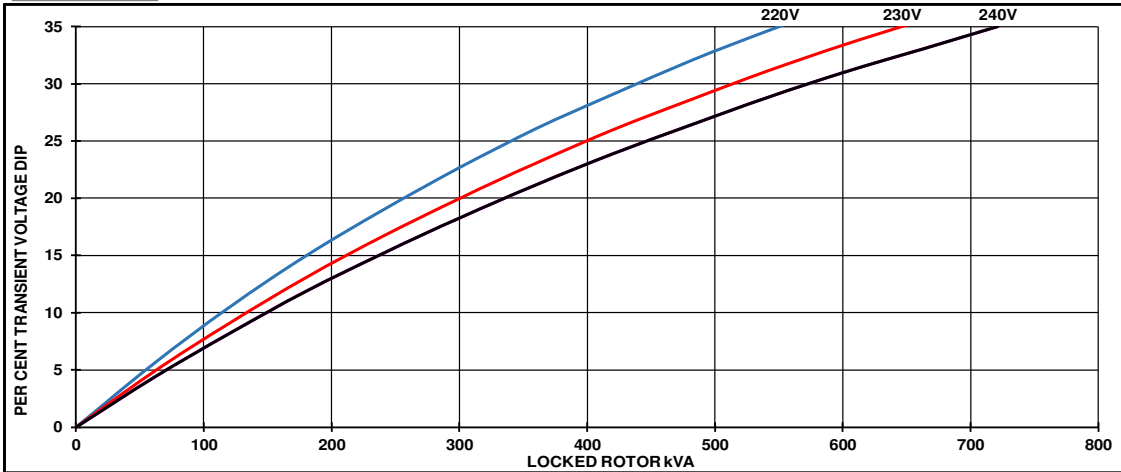
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	
< 0.5	1.00	For voltage rise multiply voltage dip by 1.25
0.5	0.97	
0.6	0.93	
0.7	0.90	
0.8	0.85	
0.9	0.83	
1.0	0.80	

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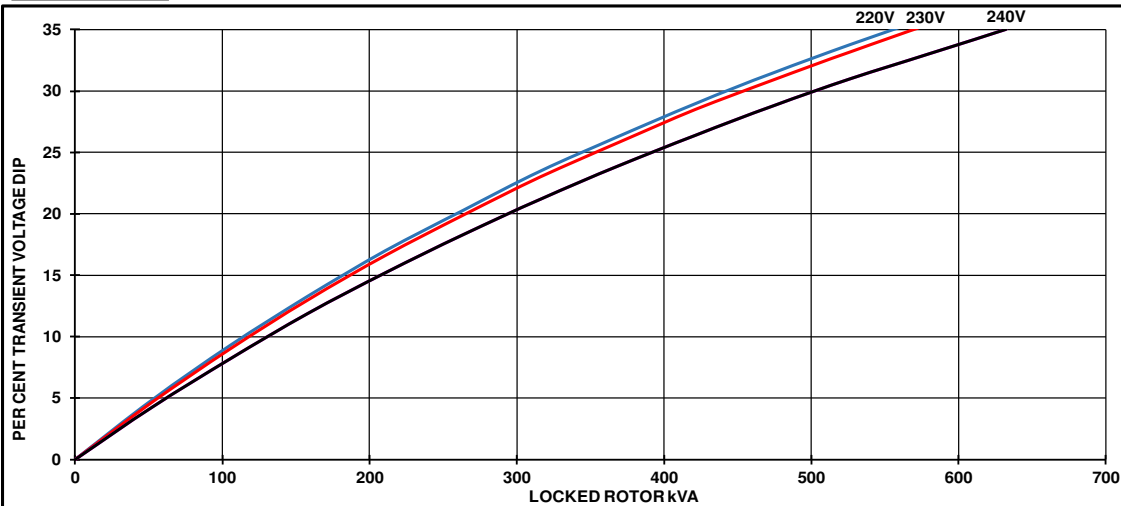
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Locked Rotor Motor Starting Curves - Self Excited

50Hz



60Hz



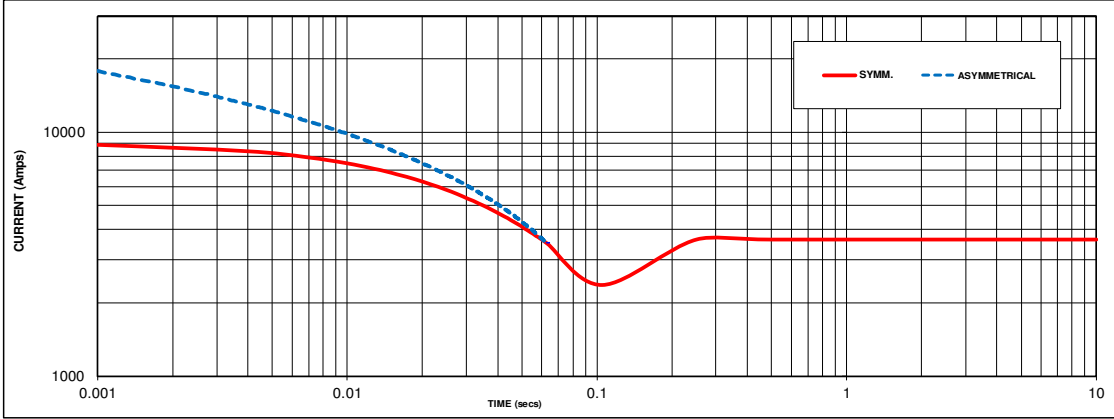
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	
< 0.5	1.00	For voltage rise multiply voltage dip by 1.25
0.5	0.97	
0.6	0.93	
0.7	0.90	
0.8	0.85	
0.9	0.83	
1.0	0.80	

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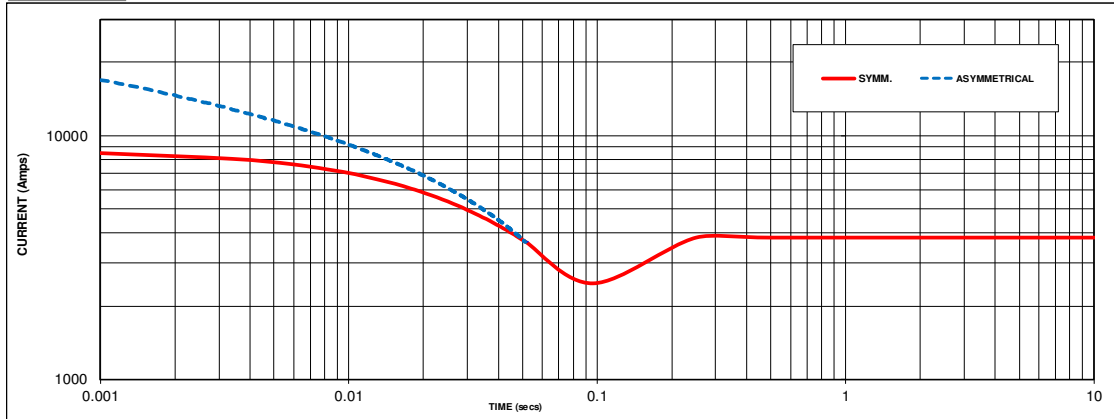
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Double Delta Short Circuit Decrement Curve

50Hz



60Hz



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
220V	X 1.00	220V	X 1.00
230V	X 1.05	230V	X 1.05
240V	X 1.09	240V	X 1.09

The sustained current value is constant irrespective of voltage level

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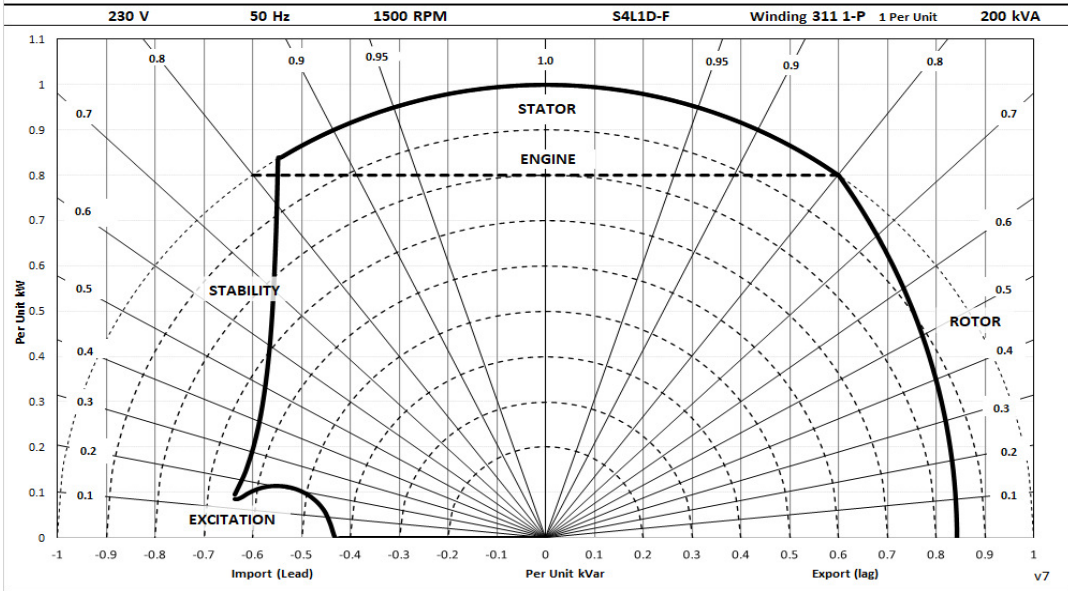
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Typical Alternator Operating Charts

230V/50Hz



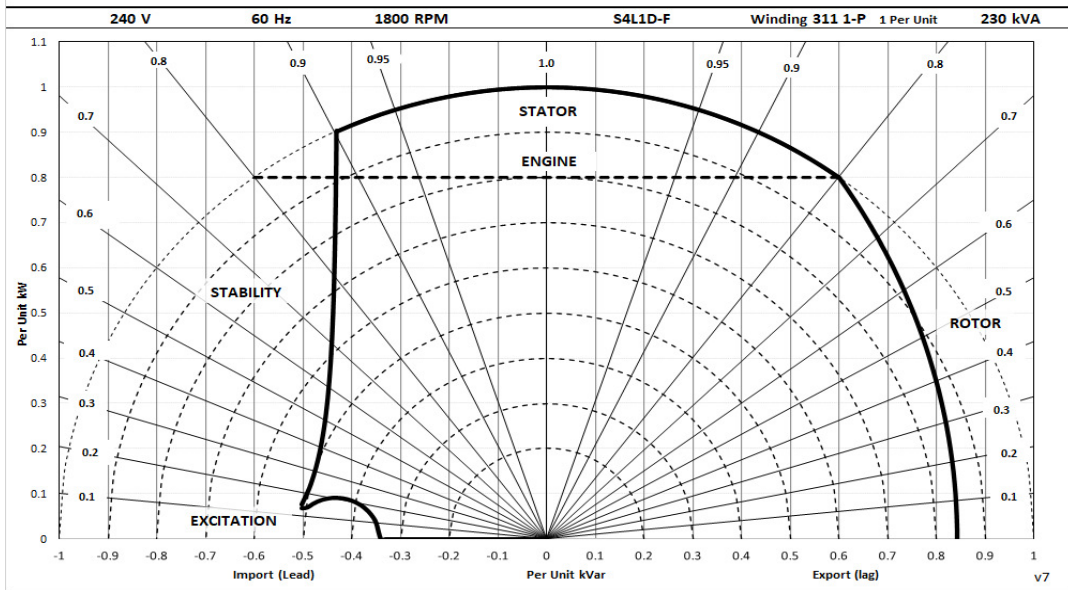
ALTERNATOR OPERATING CHART



240V/60Hz



ALTERNATOR OPERATING CHART



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RATINGS

50Hz

Class - Temp Rise	Cont. F - 105/40°C 0.8pf			Cont. H - 125/40°C 0.8pf			Cont. F - 105/40°C 1.0pf			Cont. H - 125/40°C 1.0pf		
	Double Delta (V)	220	230	240	220	230	240	220	230	240	220	230
Parallel Delta (V)	110	115	120	110	115	120	110	115	120	110	115	120
kVA	185	185	185	200	200	200	185	185	185	200	200	200
kW	148	148	148	160	160	160	185	185	185	200	200	200
Efficiency (%)	90.7	90.8	90.9	90.6	90.7	90.8	92.8	92.9	92.9	92.7	92.8	92.9
kW Input	163	163	163	177	176	176	199	199	199	216	216	215

60Hz

Class - Temp Rise	Cont. F - 105/40°C 0.8pf			Cont. H - 125/40°C 0.8pf			Cont. F - 105/40°C 1.0pf			Cont. H - 125/40°C 1.0pf		
	Double Delta (V)	220	230	240	220	230	240	220	230	240	220	230
Parallel Delta (V)	110	115	120	110	115	120	110	115	120	110	115	120
kVA	195	200	210	210	220	230	195	200	210	210	220	230
kW	156	160	168	168	176	184	195	200	210	210	220	230
Efficiency (%)	90.6	90.8	90.9	90.5	90.6	90.7	92.6	92.7	92.8	92.5	92.6	92.7
kW Input	172	176	185	186	194	203	211	216	226	227	238	248

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S4L1S-F Wdg.311 (Single Phase)

De-Rates

All values tabulated above are subject to the following reductions:

- 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
- 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 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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