

# STAMFORD

## S4L1S-C 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)	43 - 40
Full Load Excitation Current (A)	2.4 - 2.2
Exciter Time Constant (seconds)	0.105

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<b>Electrical Data</b>						
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	22.69					
	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	125	125	125	130	135	140
<b>Saturated Values in Per Unit at Base Ratings and Voltages</b>						
Xd Dir. Axis Synchronous	2.35	2.15	1.97	2.93	2.79	2.65
X'd Dir. Axis Transient	0.15	0.14	0.13	0.19	0.18	0.17
X''d Dir. Axis Subtransient	0.11	0.10	0.09	0.14	0.13	0.12
Xq Quad. Axis Reactance	2.01	1.84	1.69	2.51	2.38	2.27
X''q Quad. Axis Subtransient	0.30	0.27	0.25	0.37	0.35	0.33
Xl Leakage Reactance	0.08	0.07	0.06	0.10	0.09	0.09
X2 Negative Reactance	0.21	0.19	0.17	0.26	0.25	0.23
X0 Zero Sequence	0.08	0.07	0.06	0.10	0.09	0.09
<b>Unaturated Values in Per Unit at Base Ratings and Voltages</b>						
Xd Dir. Axis Synchronous	2.82	2.58	2.37	3.52	3.34	3.18
X'd Dir. Axis Transient	0.18	0.16	0.15	0.22	0.21	0.20
X''d Dir. Axis Subtransient	0.13	0.12	0.11	0.16	0.15	0.14
Xq Quad. Axis Reactance	2.07	1.90	1.74	2.59	2.46	2.34
X''q Quad. Axis Subtransient	0.35	0.32	0.30	0.44	0.42	0.40
Xl Leakage Reactance	0.09	0.08	0.07	0.11	0.10	0.10
X2 Negative Reactance	0.25	0.23	0.21	0.31	0.30	0.28
X0 Zero Sequence	0.09	0.08	0.08	0.11	0.11	0.10
<b>Time Constants (seconds)</b>						
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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Resistances in Ohms ( $\Omega$ ) at 22°C		
Stator Winding Resistance (Ra) per phase series star connected	0.011	
Rotor Winding Resistance (Rf)	0.92	
Exciter Stator Winding Resistance	18	
Exciter Rotor Winding Resistance per phase	0.068	
Positive Sequence Resistance (R1)	0.03249	
Negative Sequence Resistance (R2)	0.03743	
Zero Sequence Resistance (R0)	0.03249	
PMG Phase Resistance (Rpmg) per phase	1.9	
Mechanical data		
Cooling Air	0.85 m <sup>3</sup> /sec (50Hz)	1.02 m <sup>3</sup> /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	850 kg	885 kg
Weight Wound Stator	370 kg	370 kg
Weight Wound Rotor	324 kg	301 kg
Moment of Inertia	3.5531kgm <sup>2</sup>	3.3543kgm <sup>2</sup>
Shipping weight in a Crate	920 kg	945 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	

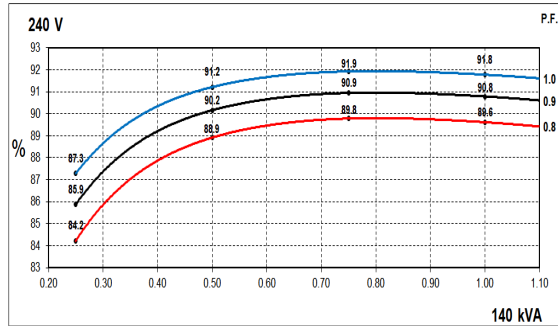
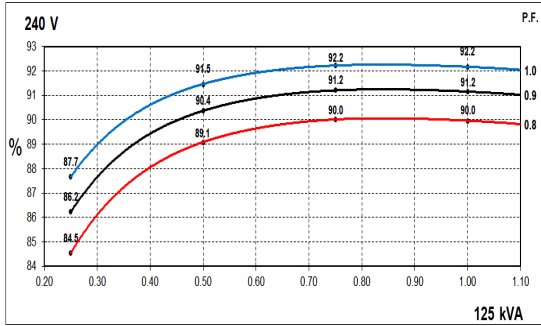
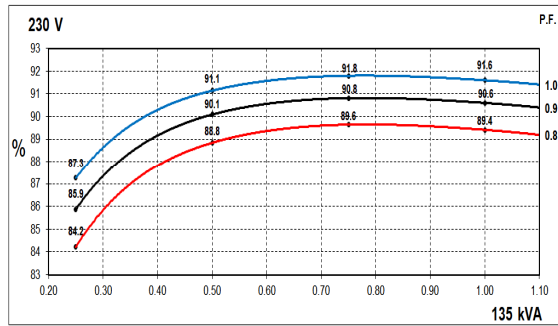
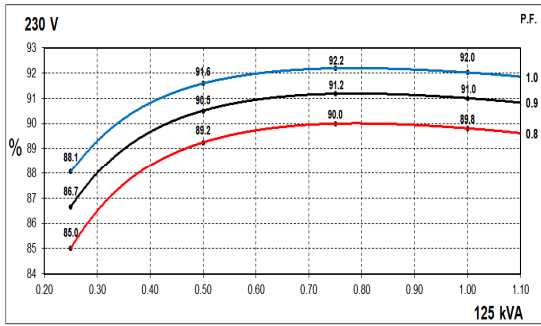
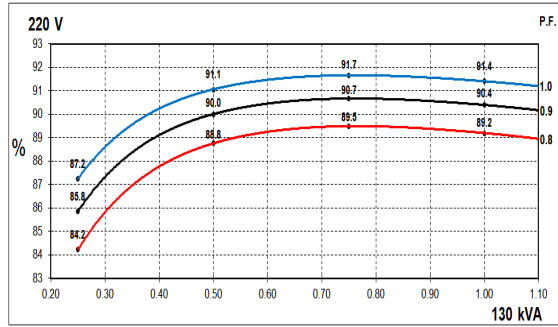
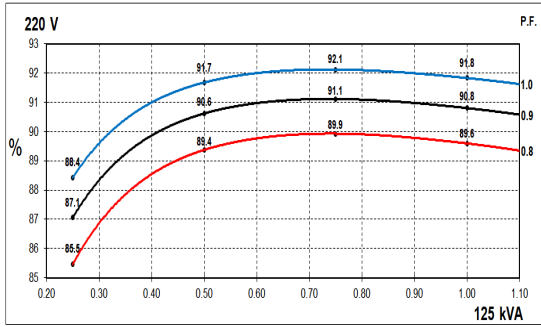
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## S4L1S-C Wdg.311 (Single Phase)

### Double Delta Efficiency Curves

**50Hz Curves**

**60Hz Curves**

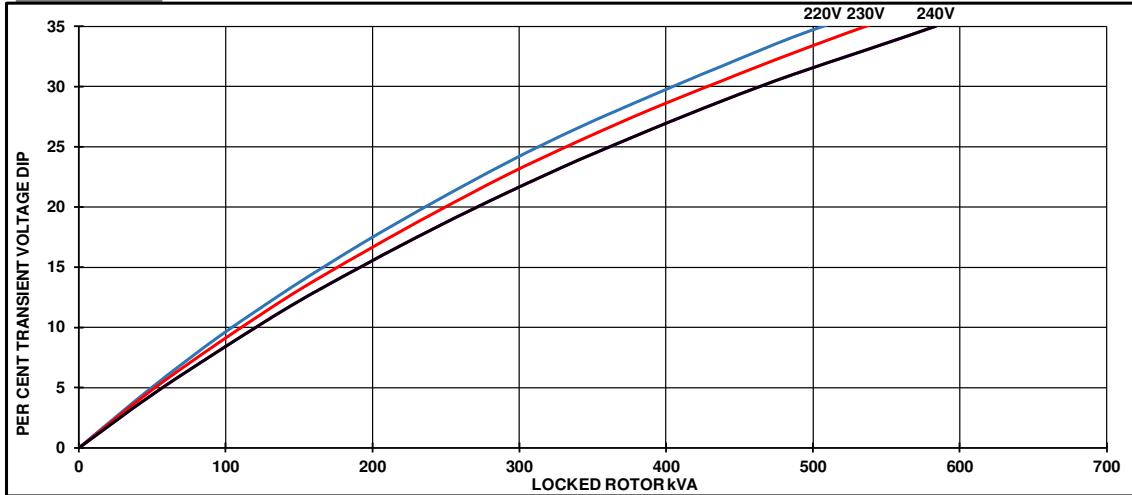


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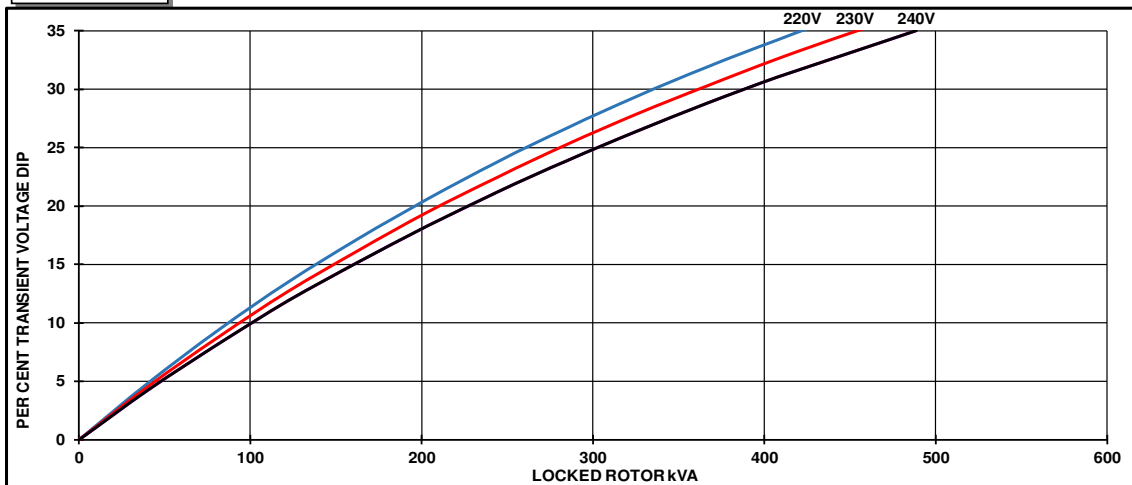
S4L1S-C Wdg.311 (Single Phase)

## Locked Rotor Motor Starting Curves - Separately Excited

**50Hz**



**60Hz**



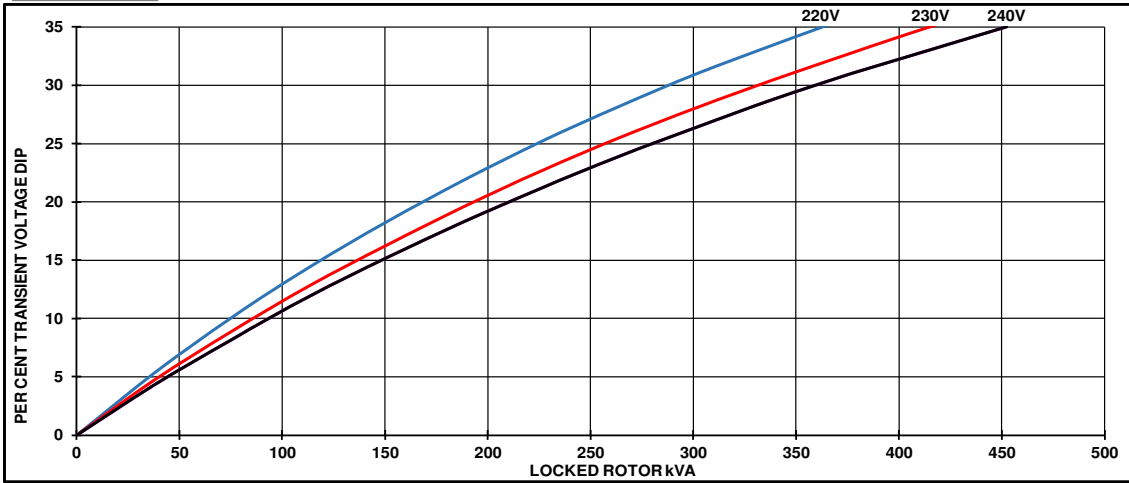
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1.00	
0.5	0.97	
0.6	0.93	
0.7	0.90	
0.8	0.85	
0.9	0.83	
1.0	0.80	

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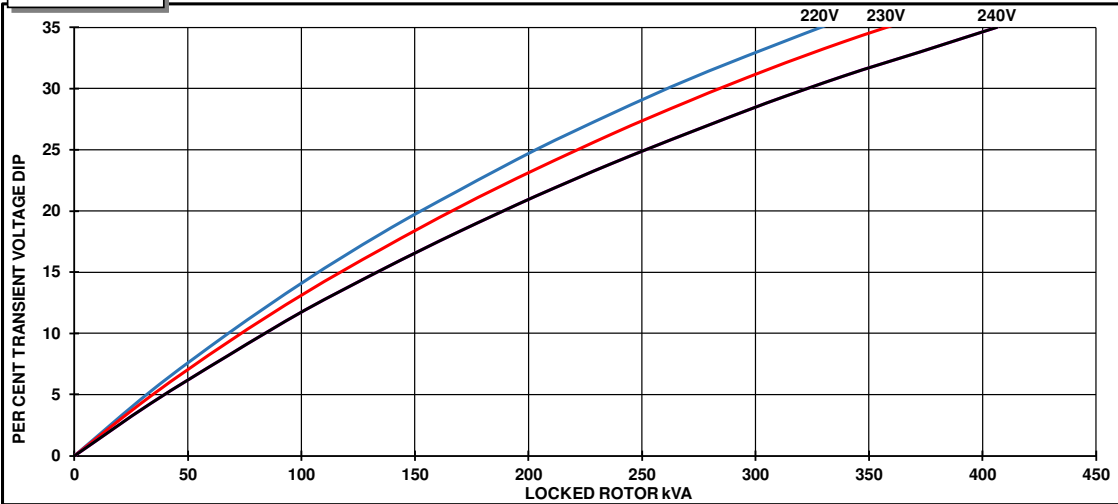
S4L1S-C Wdg.311 (Single Phase)

## Locked Rotor Motor Starting Curves - Self Excited

**50Hz**



**60Hz**



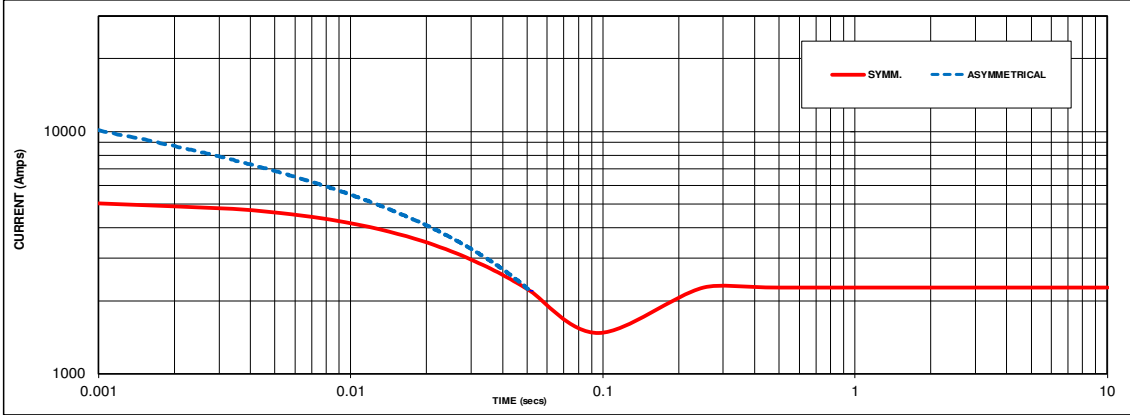
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1.00	
0.5	0.97	
0.6	0.93	
0.7	0.90	
0.8	0.85	
0.9	0.83	
1.0	0.80	

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## S4L1S-C Wdg.311 (Single Phase)

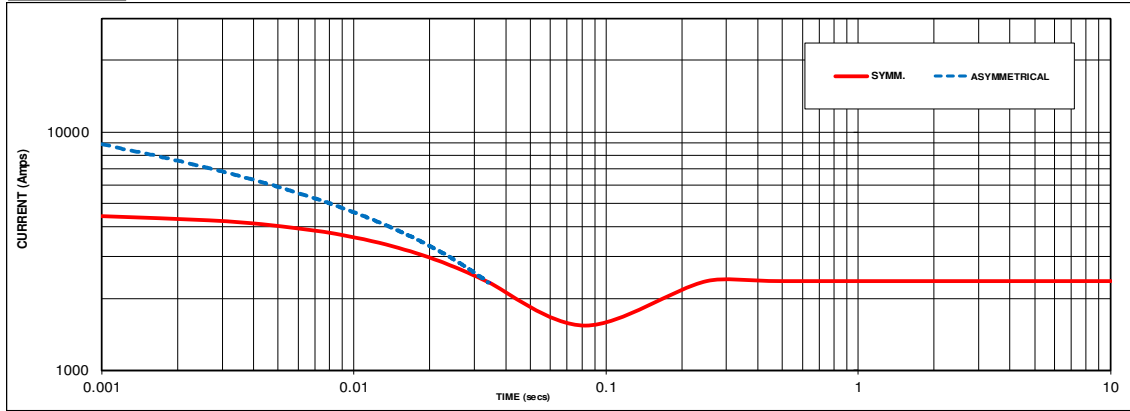
### Double Delta Short Circuit Decrement Curve

**50Hz**



Sustained Short Circuit = 2273 Amps

**60Hz**



Sustained Short Circuit = 2365 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
220V	X 1.00	220V	X 1.00
230V	X 1.05	230V	X 1.05
240V	X 1.09	240V	X 1.09

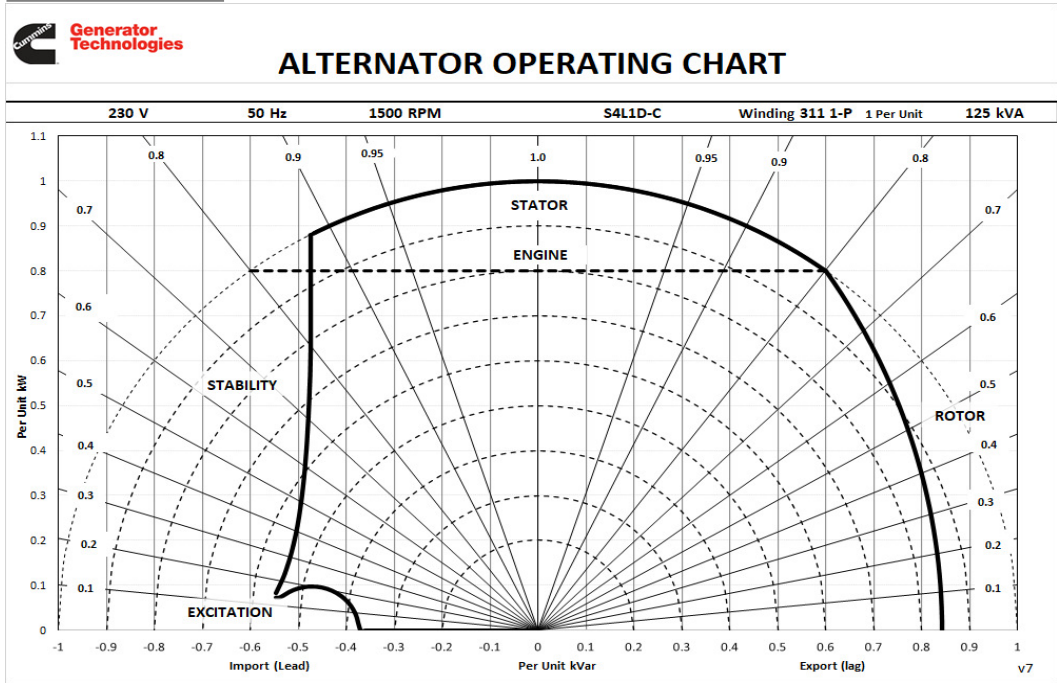
The sustained current value is constant irrespective of voltage level

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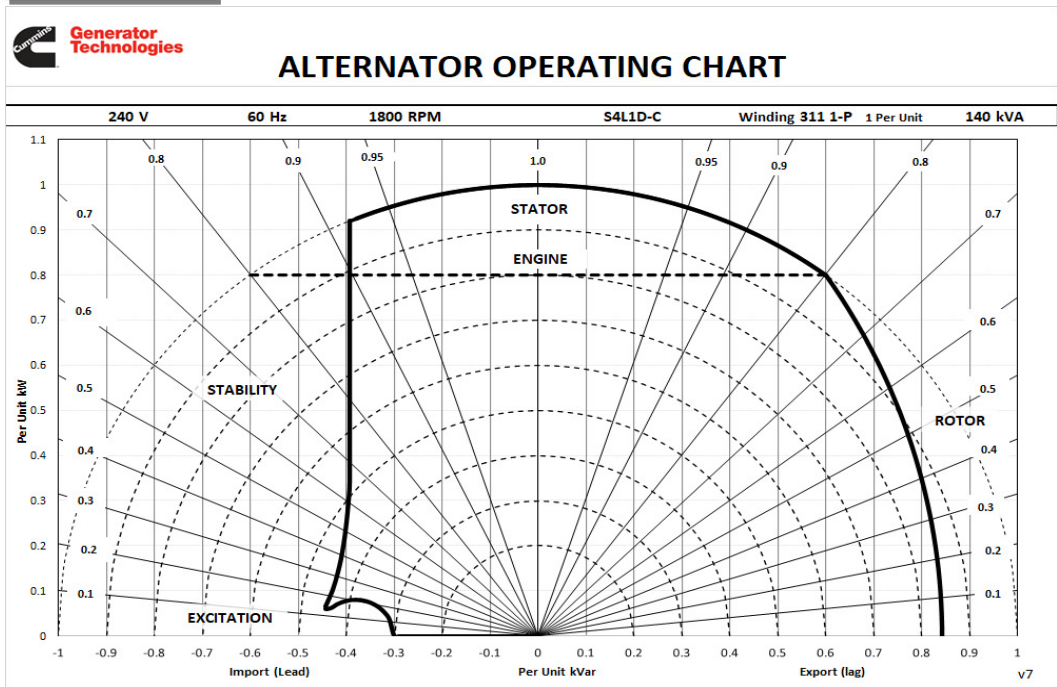
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### Typical Alternator Operating Charts

**230V/50Hz**



**240V/60Hz**





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## S4L1S-C Wdg.311 (Single Phase)

### RATINGS

#### 50Hz

Class - Temp Rise	Cont. F - 105/40°C <b>0.8pf</b>			Cont. H - 125/40°C <b>0.8pf</b>			Cont. F - 105/40°C <b>1.0pf</b>			Cont. H - 125/40°C <b>1.0pf</b>		
	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	115	115	115	125	125	125	115	115	115	125	125	125
kW	92	92	92	100	100	100	115	115	115	125	125	125
Efficiency (%)	89.7	89.9	90.0	89.6	89.8	90.0	92.0	92.1	92.2	91.8	92.0	92.2
kW Input	103	102	102	112	111	111	125	125	125	136	136	136

#### 60Hz

Class - Temp Rise	Cont. F - 105/40°C <b>0.8pf</b>			Cont. H - 125/40°C <b>0.8pf</b>			Cont. F - 105/40°C <b>1.0pf</b>			Cont. H - 125/40°C <b>1.0pf</b>		
	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	120	125	130	130	135	140	120	125	130	130	135	140
kW	96	100	104	104	108	112	120	125	130	130	135	140
Efficiency (%)	89.3	89.5	89.7	89.2	89.4	89.6	91.5	91.7	91.9	91.4	91.6	91.8
kW Input	108	112	116	117	121	125	131	136	141	142	147	153

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### 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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