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S4L1S-D 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 - 39
Full Load Excitation Current (A)	2.3 - 2.2
Exciter Time Constant (seconds)	0.105

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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 Suppresion	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 Sate X/R Ratio	19.68					
	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	150	150	150	155	165	170
Saturrated Values in Per Unit at Base Ratings and Voltages						
Xd Dir. Axis Synchronous	2.35	2.15	1.97	2.91	2.84	2.69
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	1.98	1.81	1.66	2.45	2.39	2.26
X"q Quad. Axis Subtransient	0.30	0.27	0.25	0.37	0.36	0.34
X_L Leakage Reactance	0.05	0.05	0.05	0.07	0.07	0.06
X_2 Negative Reactance	0.20	0.18	0.17	0.24	0.24	0.22
X_0 Zero Sequence	0.08	0.07	0.06	0.09	0.09	0.09
Unaturrated Values in Per Unit at Base Ratings and Voltages						
Xd Dir. Axis Synchronous	2.82	2.58	2.37	3.50	3.41	3.22
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	0.15
Xq Quad. Axis Reactance	2.04	1.86	1.71	2.53	2.46	2.33
X"q Quad. Axis Subtransient	0.35	0.32	0.30	0.44	0.43	0.40
X_L Leakage Reactance	0.06	0.06	0.05	0.08	0.07	0.07
X_2 Negative Reactance	0.24	0.22	0.20	0.29	0.29	0.27
X_0 Zero Sequence	0.09	0.08	0.08	0.11	0.11	0.10
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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Resistances in Ohms (Ω) at 22°C		
Stator Winding Resistance (Ra) per phase series star connected	0.008	
Rotor Winding Resistance (Rf)	1.05	
Exciter Stator Winding Resistance	18	
Exciter Rotor Winding Resistance per phase	0.068	
Positive Sequence Resistance (R1)	0.0155	
Negative Sequence Resistance (R2)	0.017856	
Zero Sequence Resistance (R0)	0.0155	
PMG Phase Resistance (Rpmg) per phase	1.9	
Mechanical data		
Cooling Air	0.83 m³/sec (50Hz)	0.99 m³/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	940 kg	950
Weight Wound Stator	415 kg	415
Weight Wound Rotor	361 kg	338
Moment of Inertia	4.0771 kgm2	3.8783
Shipping weight in a Crate	1010 kg	1010
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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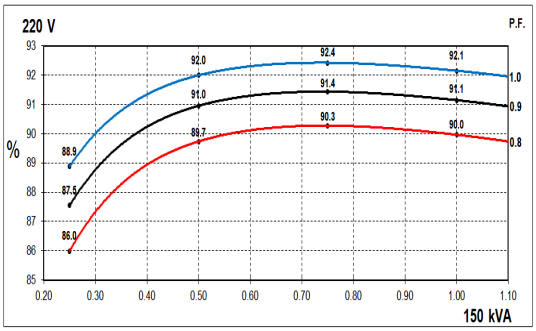
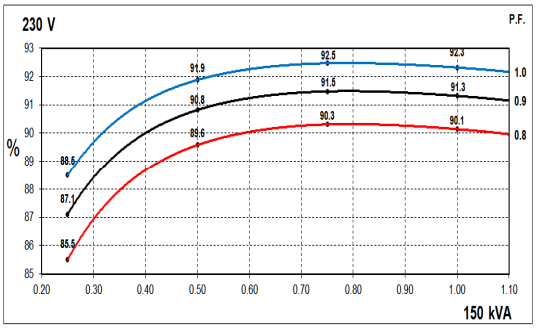
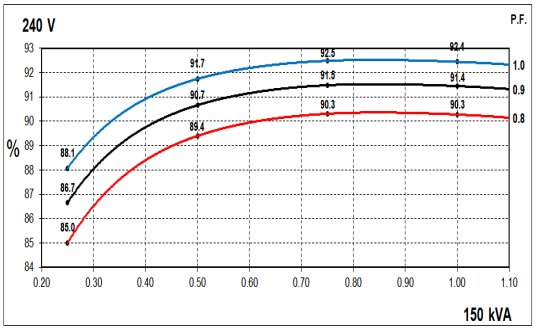
Double Delta Efficiency Curves

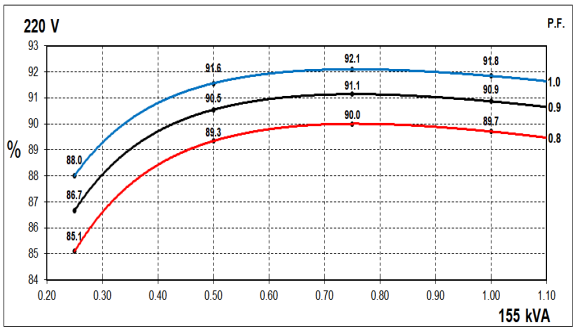
50Hz Curves

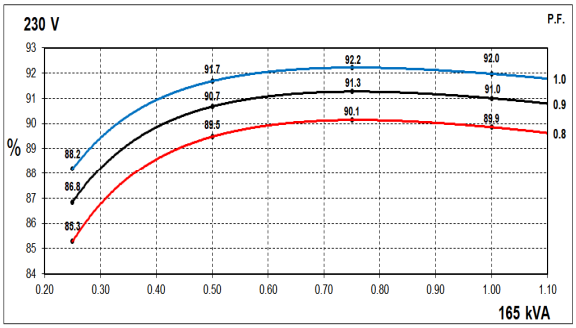


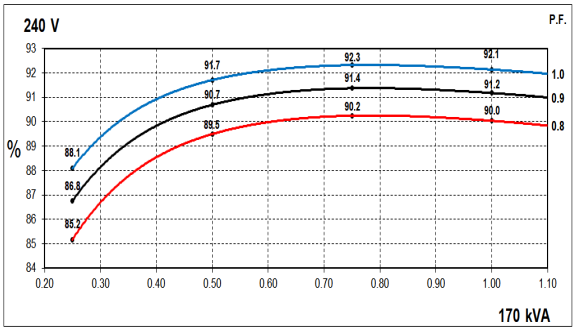




60Hz Curves

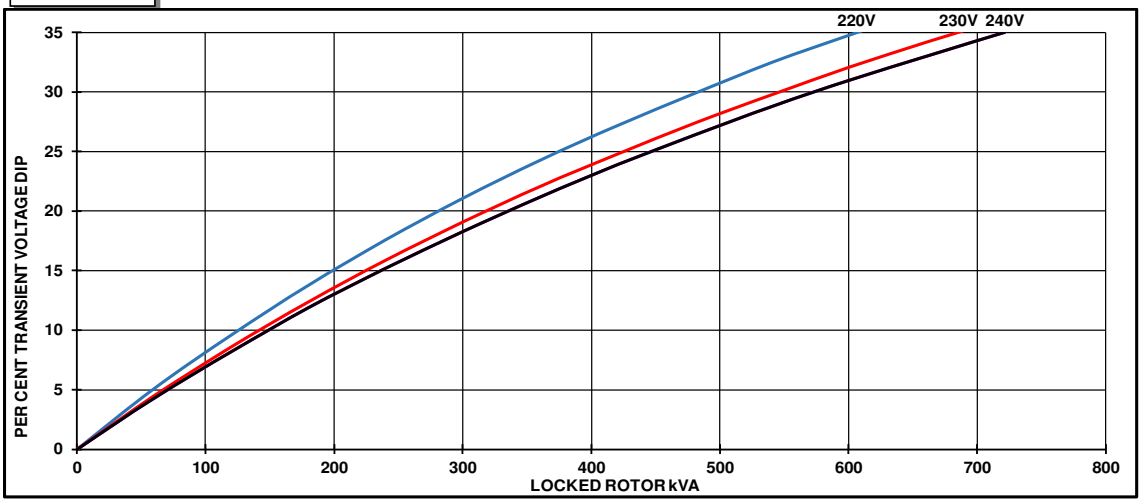




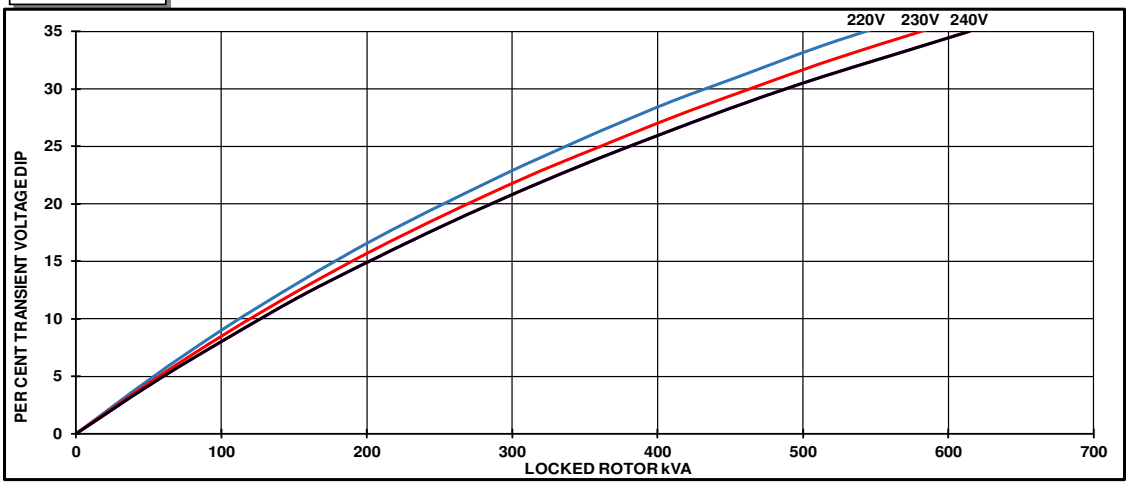


Locked Rotor Motor Starting Curves - Separately Excited

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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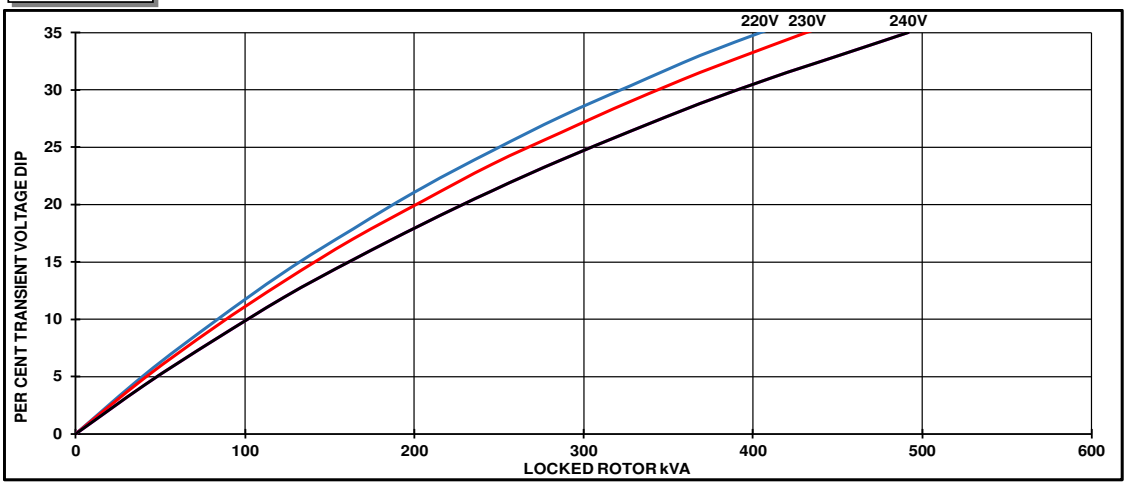
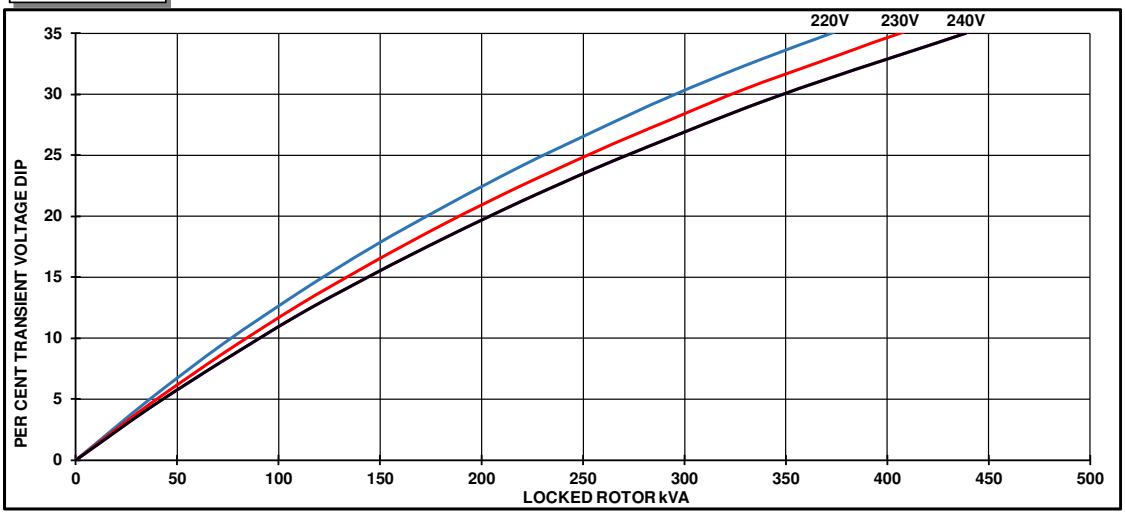
Locked Rotor Motor Starting Curves - Self Excited

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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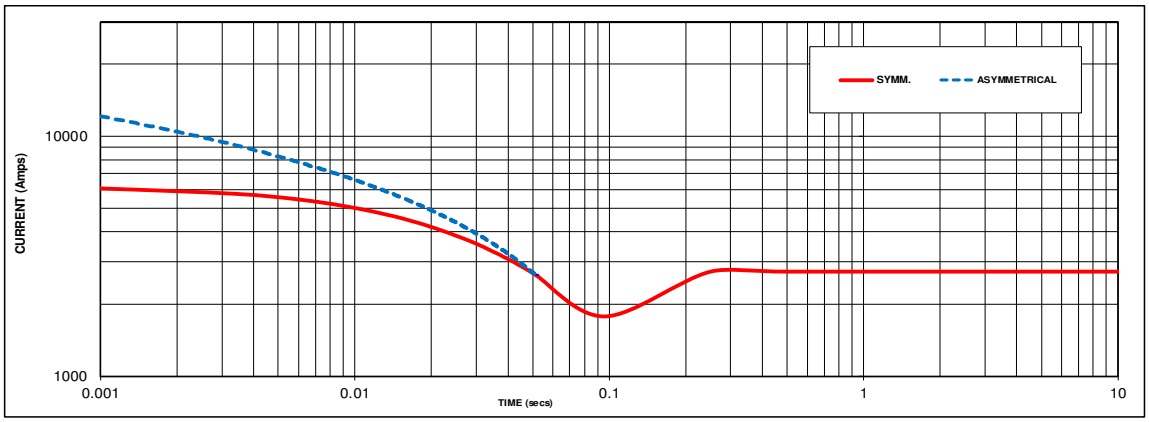
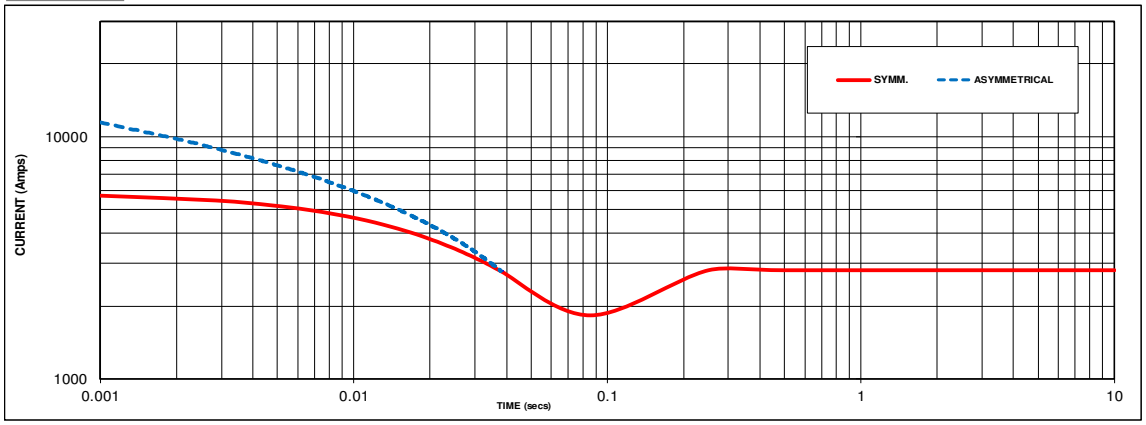
Double Delta Short Circuit Decrement Curve

50Hz



Sustained Short Circuit = 2727 Amps

60Hz



Sustained Short Circuit = 2818 Amps

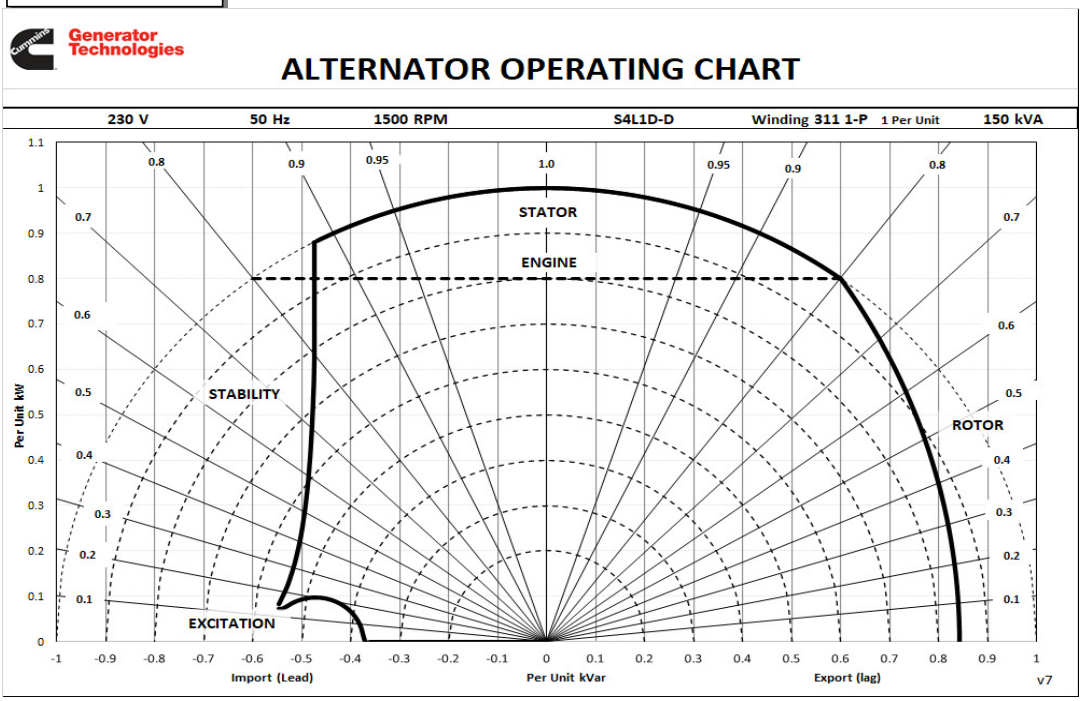
Note 1
The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

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

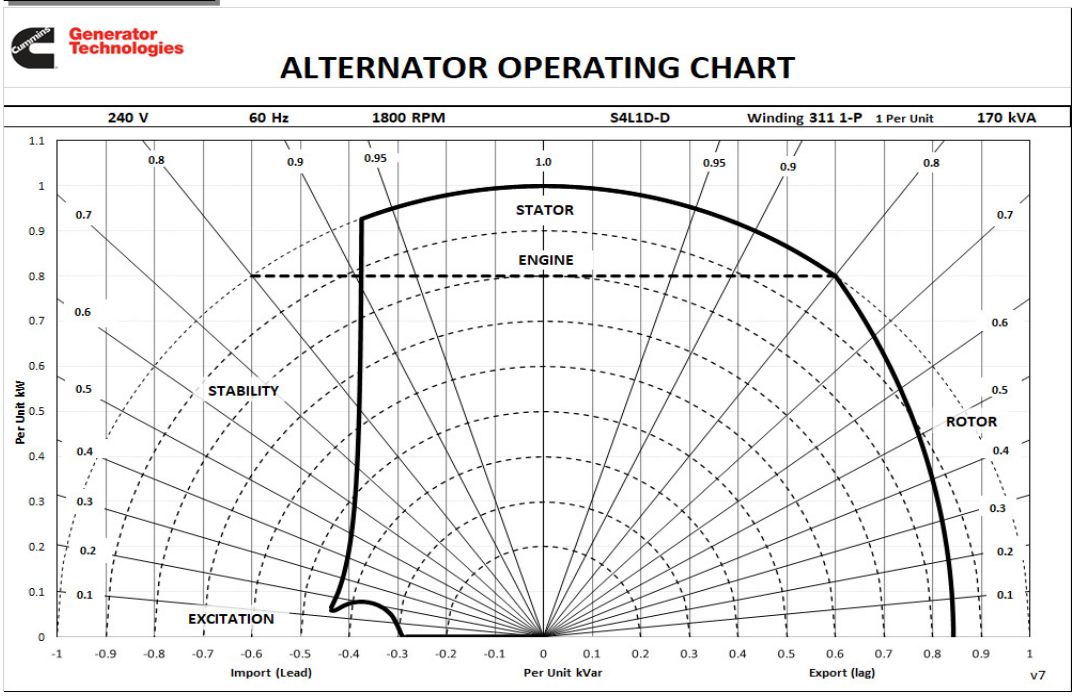
The sustained current value is constant irrespective of voltage level

Typical Alternator Operating Charts

230V/50Hz



240V/60Hz



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RATINGS

50Hz

Class - Temp Rise	Cont. F - 105/40℃		**0.8pf**	Cont. H - 125/40℃		**0.8pf**	Cont. F - 105/40℃		**1.0pf**	Cont. H - 125/40℃		**1.0pf**
Double Delta (V)	220	230	240	220	230	240	220	230	240	220	230	240
Parallel Delta (V)	110	115	120	110	115	120	110	115	120	110	115	120
kVA	140	140	140	150	150	150	140	140	140	150	150	150
kW	112	112	112	120	120	120	140	140	140	150	150	150
Efficiency (%)	90.1	90.2	90.3	90.0	90.1	90.3	92.3	92.4	92.5	92.1	92.3	92.4
kW Input	124	124	124	133	133	133	152	152	151	163	163	162

60Hz

Class - Temp Rise	Cont. F - 105/40℃		**0.8pf**	Cont. H - 125/40℃		**0.8pf**	Cont. F - 105/40℃		**1.0pf**	Cont. H - 125/40℃		**1.0pf**
Double Delta (V)	220	230	240	220	230	240	220	230	240	220	230	240
Parallel Delta (V)	110	115	120	110	115	120	110	115	120	110	115	120
kVA	145	155	160	155	165	170	145	155	160	155	165	170
kW	116	124	128	124	132	136	145	155	160	155	165	170
Efficiency (%)	89.8	90.0	90.1	89.7	89.9	90.0	91.9	92.1	92.2	91.8	92.0	92.1
kW Input	129	138	142	138	147	151	158	168	174	169	179	185

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℃ by which the operational ambient temperature exceeds 40℃
- For any other operating conditions impacting the cooling circuit please refer to applications

Note: Requirement for operating in an ambient exceeding 60℃ 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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