

# STAMFORD®

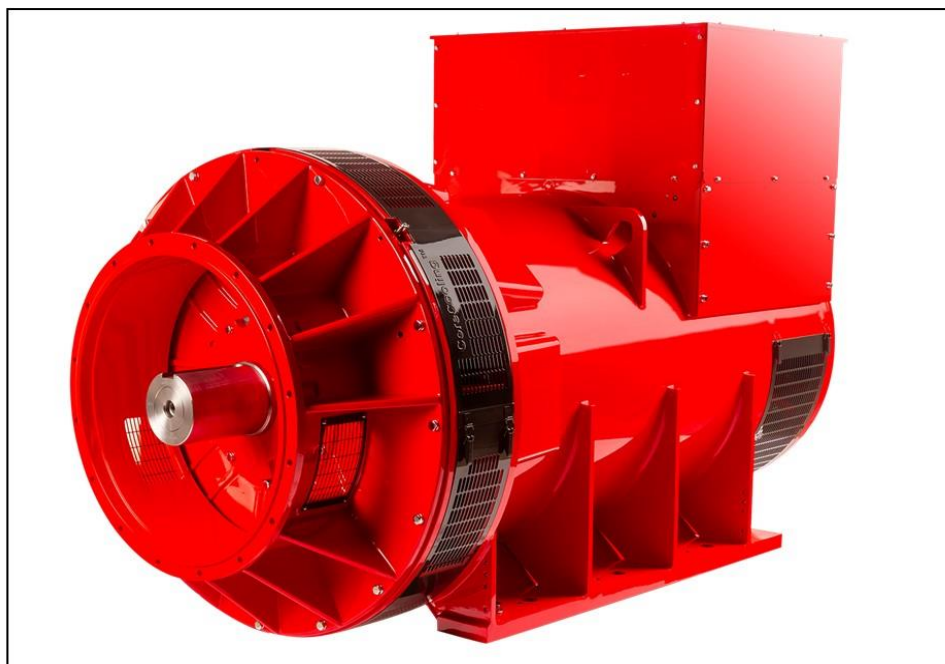
## S7L1D-C4 Wdg.312 - Technical Data Sheet

### Standards

STAMFORD industrial alternators meet the requirements of the relevant parts of the 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	MX341	MX322	DECS150		
Voltage Regulation	± 1%	± 0.5%	± 0.25%		with 4% Engine Governing
AVR Power	PMG	PMG	PMG		

No Load Excitation Voltage (V)	13.8 - 13.3
No Load Excitation Current (A)	0.61 - 0.58
Full Load Excitation Voltage (V)	70
Full Load Excitation Current (A)	2.8
Exciter Time Constant (seconds)	0.125

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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	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
Short Circuit Ratio	1/Xd							
Steady State X/R Ratio	23.88							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	2.71 m³/sec				3.25 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)	1505	1550	1550	1520	1706	1819	1856	1894
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.95	2.74	2.55	2.22	3.35	3.19	2.98	2.79
X'd Dir. Axis Transient	0.23	0.21	0.20	0.17	0.26	0.24	0.23	0.21
X''d Dir. Axis Subtransient	0.15	0.14	0.13	0.11	0.16	0.16	0.15	0.14
Xq Quad. Axis Reactance	2.10	1.96	1.82	1.59	2.39	2.28	2.13	1.99
X''q Quad. Axis Subtransient	0.25	0.23	0.21	0.19	0.28	0.27	0.25	0.23
XL Stator Leakage Reactance	0.09	0.08	0.08	0.07	0.10	0.10	0.09	0.08
X2 Negative Sequence Reactance	0.20	0.19	0.17	0.15	0.23	0.22	0.20	0.19
X0 Zero Sequence Reactance	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.03
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	3.54	3.29	3.05	2.66	4.02	3.83	3.57	3.35
X'd Dir. Axis Transient	0.26	0.24	0.22	0.20	0.29	0.28	0.26	0.25
X''d Dir. Axis Subtransient	0.17	0.16	0.15	0.13	0.19	0.18	0.17	0.16
Xq Quad. Axis Reactance	2.17	2.01	1.87	1.63	2.46	2.34	2.19	2.05
X''q Quad. Axis Subtransient	0.30	0.28	0.26	0.22	0.34	0.32	0.30	0.28
XL Stator Leakage Reactance	0.10	0.09	0.09	0.08	0.11	0.11	0.10	0.10
Xlr Rotor Leakage Reactance	0.23	0.21	0.20	0.17	0.26	0.25	0.23	0.21
X2 Negative Sequence Reactance	0.24	0.22	0.21	0.18	0.27	0.26	0.24	0.23
X0 Zero Sequence Reactance	0.03	0.03	0.03	0.02	0.04	0.03	0.03	0.03

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<b>Time Constants (Seconds)</b>		
T'd Transient Time Const.	0.155	
T''d Sub-Transient Time Const.	0.0177	
T'do O.C. Field Time Const.	4.05	
Ta Armature Time Const.	0.0360	
T''q Sub-Transient Time Const.	0.0090	
<b>Resistances in Ohms (<math>\Omega</math>) at 22°C</b>		
Stator Winding Resistance (Ra), per phase for series connected	0.0012	
Rotor Winding Resistance (Rf)	1.71	
Exciter Stator Winding Resistance	22.3	
Exciter Rotor Winding Resistance per phase	0.065	
PMG Phase Resistance (Rpmg) per phase	1.91	
Positive Sequence Resistance (R1)	0.0015	
Negative Sequence Resistance (R2)	0.0017	
Zero Sequence Resistance (R0)	0.0015	
<b>Saturation Factors</b>	<b>400V</b>	<b>480V</b>
SG1.0	0.252	0.282
SG1.2	1.166	1.121
<b>Mechanical Data</b>		
Shaft and Keys	All alternator rotors are dynamically balanced to better than BS6861: Part 1 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.	
	1 Bearing	2 Bearing
SAE Adaptor	SAE 0, 00	SAE 0, 00
Moment of Inertia	36.38 kgm <sup>2</sup>	35.63 kgm <sup>2</sup>
Weight Wound Stator	1286kg	1286kg
Weight Wound Rotor	1153kg	1107kg
Weight Complete Alternator	2910kg	2884kg
Shipping weight in a Crate	2959kg	2933kg
Packing Crate Size	200 x 105 x 155 (cm)	200 x 105 x 155 (cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL. 6228
Bearing Non-Drive End	BALL. 6319	BALL. 6319

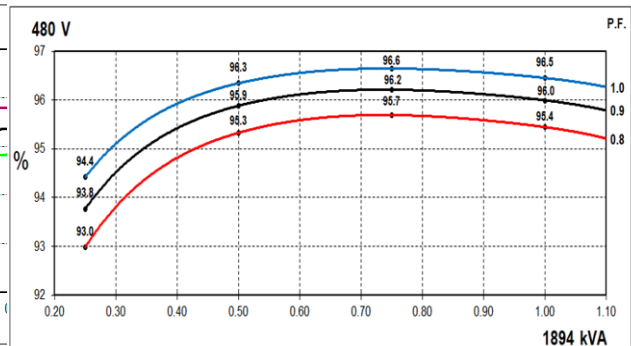
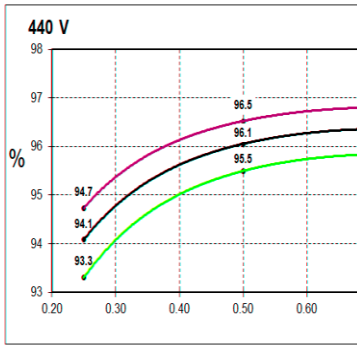
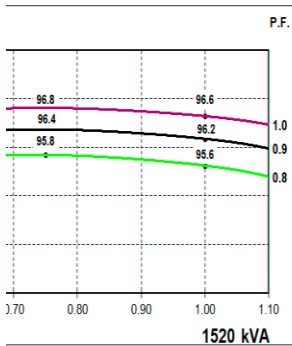
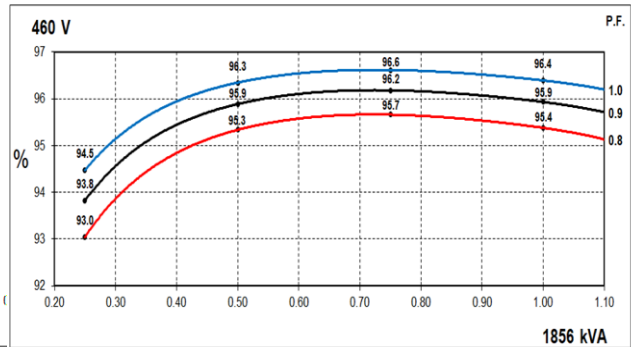
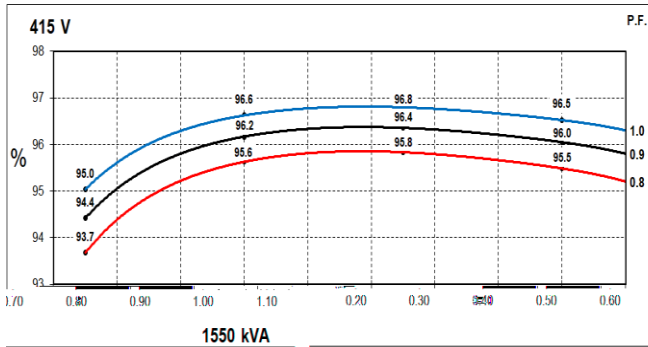
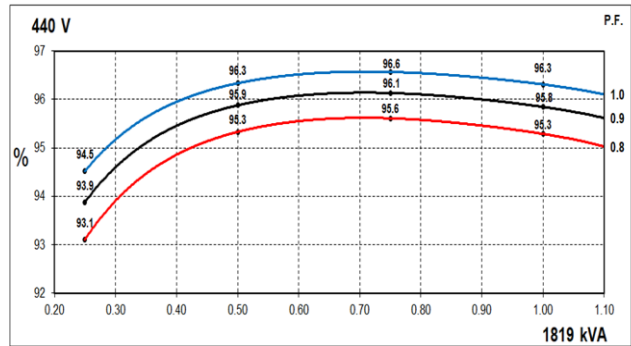
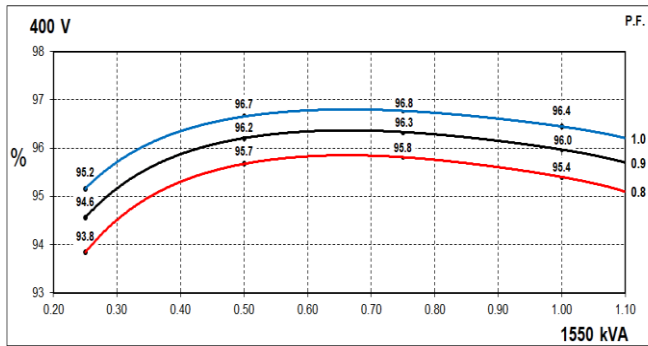
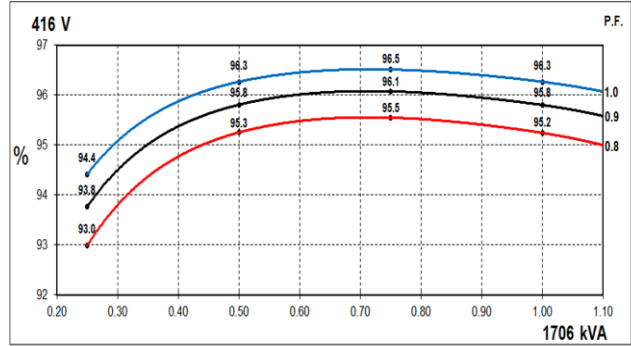
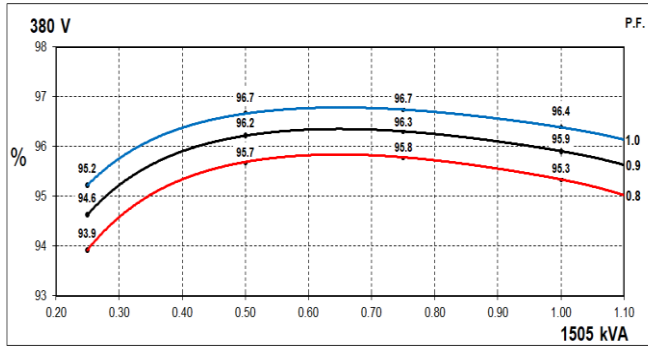
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### THREE PHASE EFFICIENCY CURVES

50Hz

60Hz

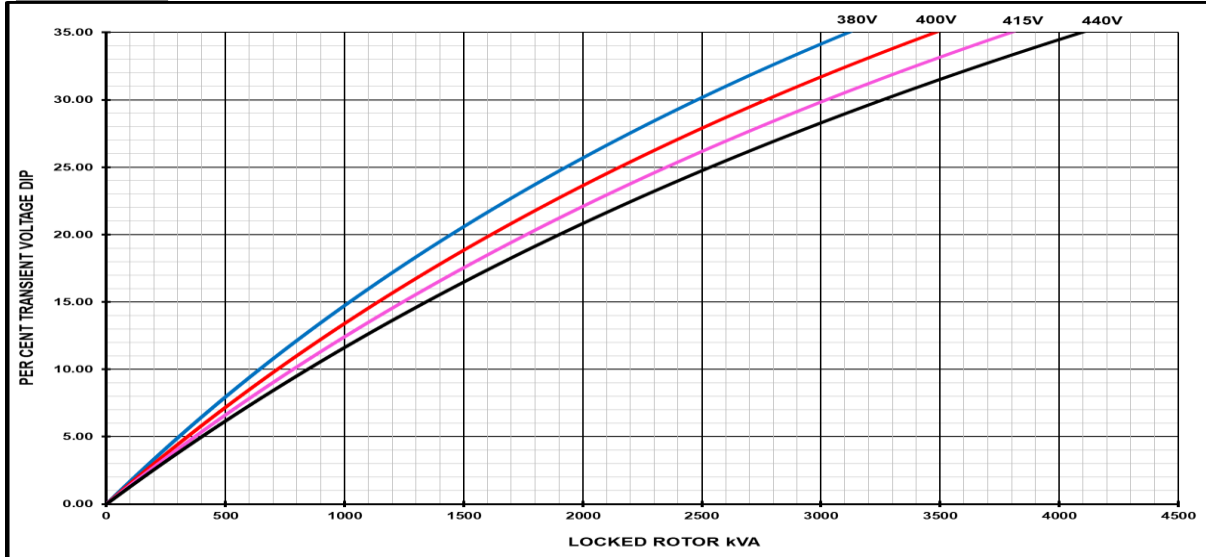


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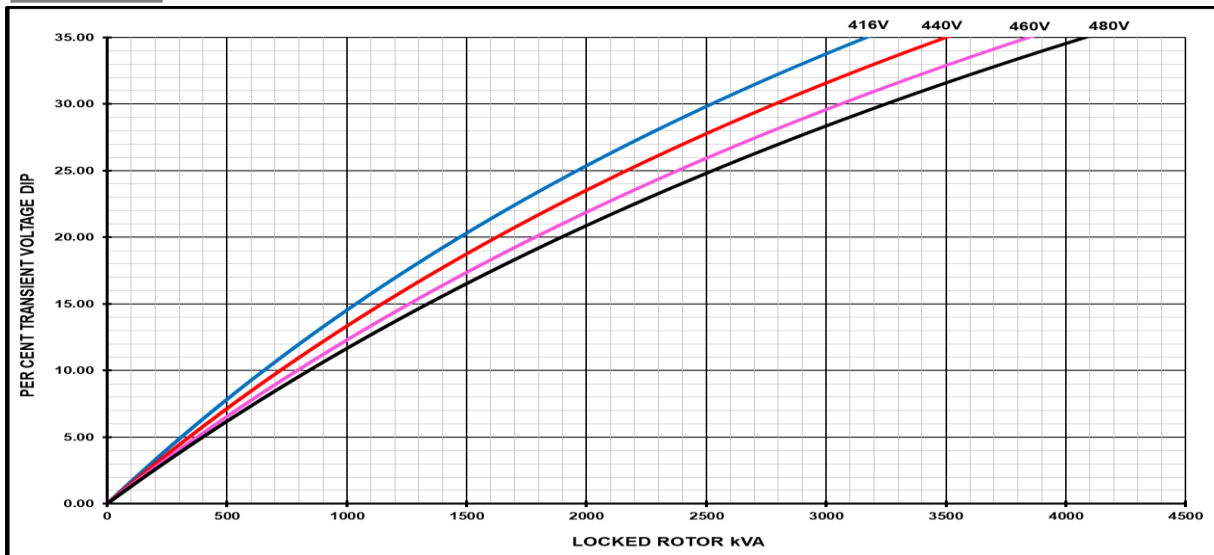
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## Locked Rotor Motor Starting Curves - Separately Excited

**50Hz**



**60Hz**



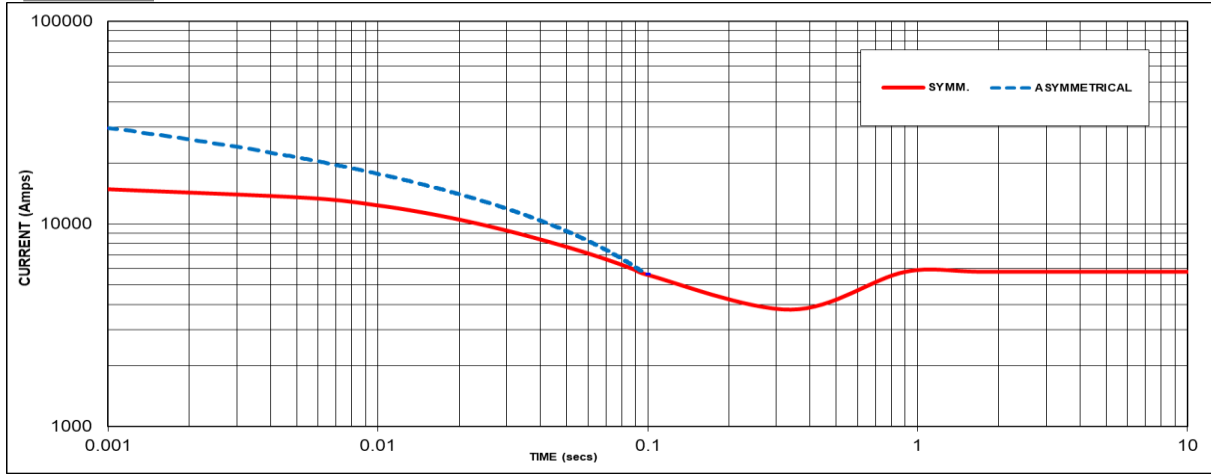
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1	
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

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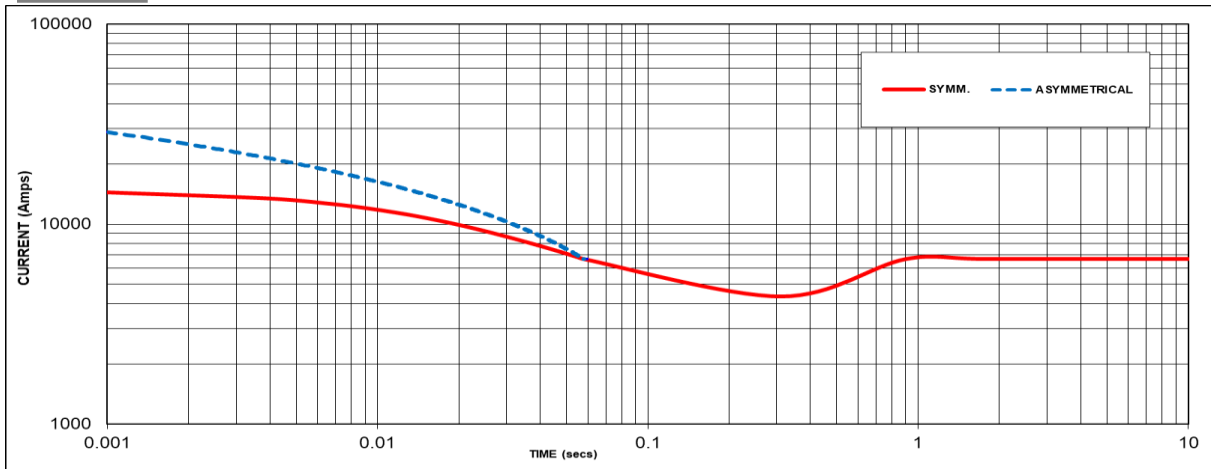
### Three-phase Short Circuit Decrement Curve - Separately Excited

**50Hz**



Sustained Short Circuit = 5820 Amps

**60Hz**



Sustained Short Circuit = 6704 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 1.10
440V	X 1.16	480V	X 1.15

The sustained current value is constant irrespective of voltage level

**Note 2**

The sustained current values are for MX341 AVR. For MX322 and Digital AVR 1.2 factor to be applied to the sustained short circuit

**Note 3**

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.

All other times are unchanged

**Note 4**

Curves are drawn for Star connected machines under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :

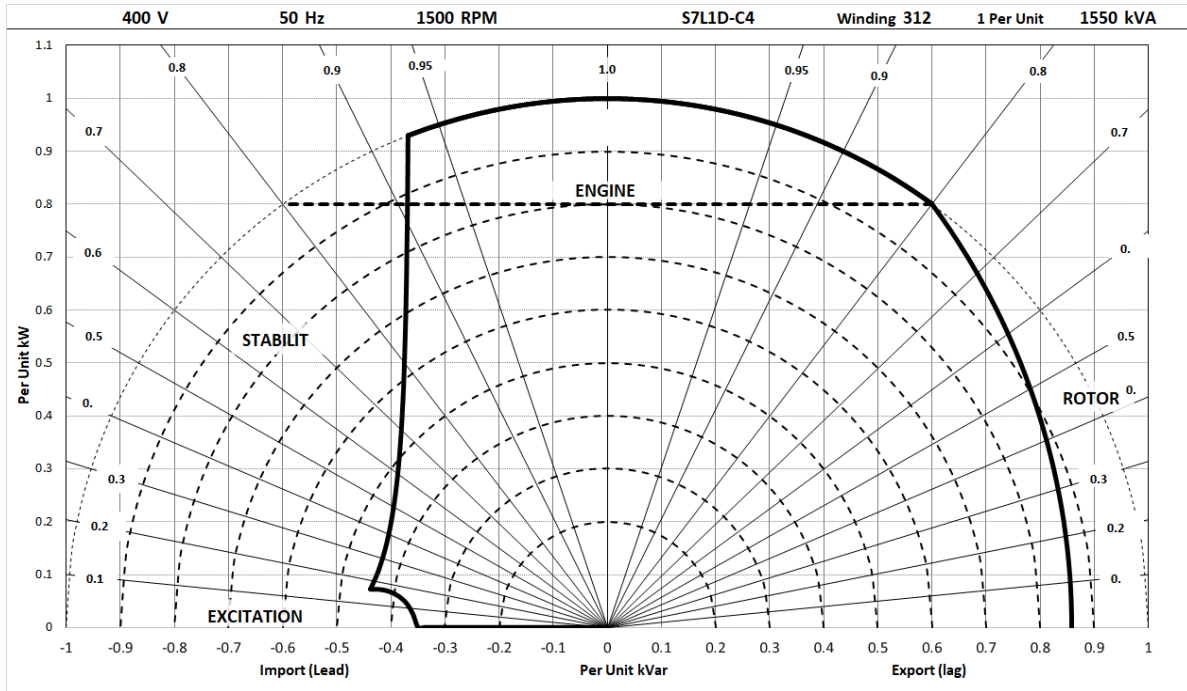
Parallel Star = Curve current value X 2  
 Series Delta = Curve current value X 1.732

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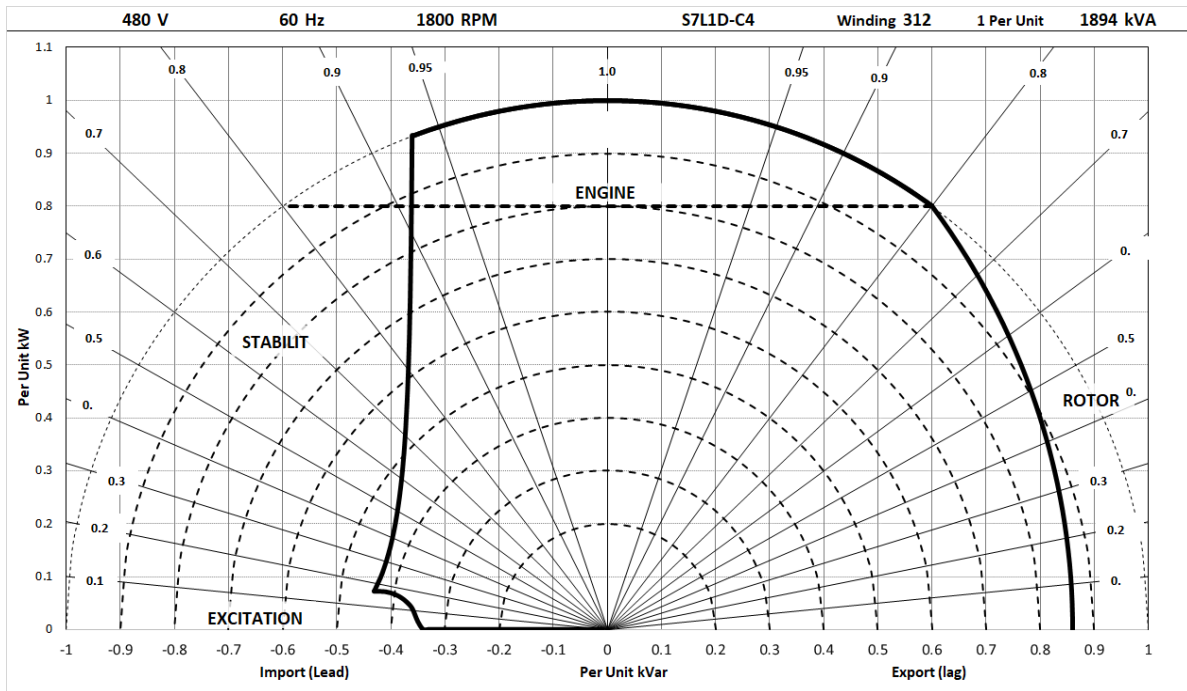
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## Typical Alternator Operating Charts

**400V/50Hz**



**480V/60Hz**



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### RATINGS AT 0.8 POWER FACTOR

Class - Temp Rise		Standby - 163/27°C				Standby - 150/40°C				Cont. H - 125/40°C				Cont. F - 105/40°C			
<b>50</b> 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	1615	1660	1660	1630	1570	1615	1615	1590	1505	1550	1550	1520	1400	1445	1445	1415
	kW	1292	1328	1328	1304	1256	1292	1292	1272	1204	1240	1240	1216	1120	1156	1156	1132
	Efficiency (%)	95.1	95.2	95.3	95.5	95.2	95.3	95.4	95.5	95.3	95.4	95.5	95.6	95.5	95.6	95.6	95.7
	kW Input	1358	1395	1393	1366	1319	1356	1354	1331	1263	1300	1299	1272	1173	1210	1209	1183

<b>60</b> 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	1820	1945	1985	2025	1775	1894	1931	1975	1706	1819	1856	1894	1594	1694	1725	1762
	kW	1456	1556	1588	1620	1420	1515	1545	1580	1365	1455	1485	1515	1275	1355	1380	1410
	Efficiency (%)	95.1	95.1	95.2	95.3	95.2	95.2	95.3	95.4	95.2	95.3	95.4	95.4	95.4	95.4	95.5	95.6
	kW Input	1531	1636	1668	1700	1492	1592	1621	1657	1433	1527	1557	1588	1337	1420	1445	1475

#### 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 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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