

# STAMFORD®

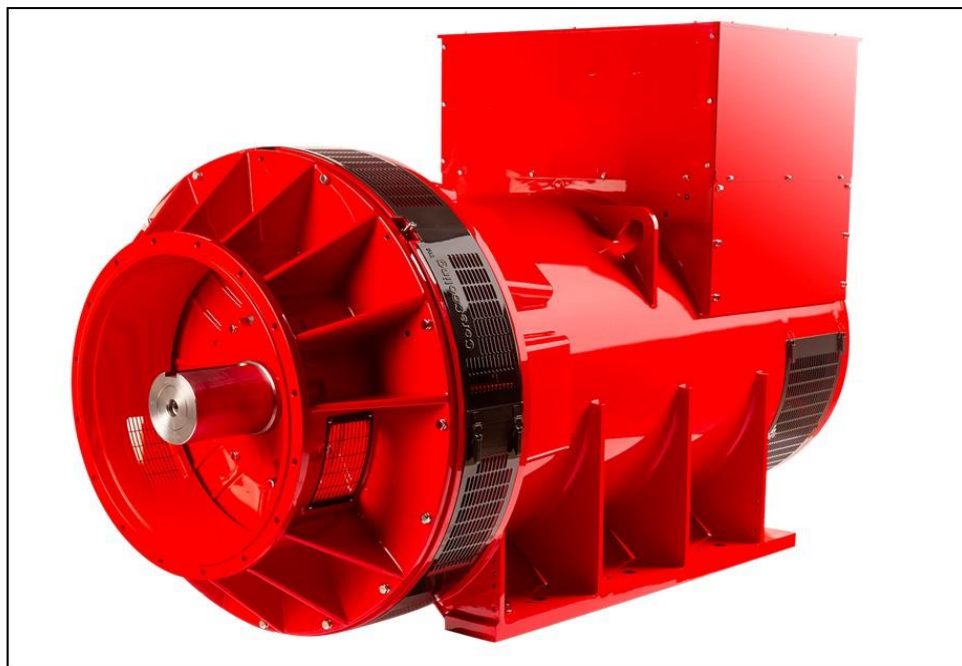
## S7L1D-H4 Wdg.312 - Technical Data Sheet

### 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)	15.9 - 14.5
No Load Excitation Current (A)	0.81 - 0.74
Full Load Excitation Voltage (V)	62
Full Load Excitation Current (A)	2.9
Exciter Time Constant (seconds)	0.165

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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	32.20							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	2.2 m <sup>3</sup> /sec				2.64 m <sup>3</sup> /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)	2135	2250	2250	2160	2425	2537	2625	2750
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.18	2.07	1.92	1.64	2.48	2.31	2.19	2.11
X'd Dir. Axis Transient	0.17	0.16	0.15	0.13	0.19	0.18	0.17	0.16
X''d Dir. Axis Subtransient	0.12	0.12	0.11	0.09	0.14	0.13	0.12	0.12
Xq Quad. Axis Reactance	1.73	1.65	1.53	1.31	1.97	1.84	1.74	1.68
X''q Quad. Axis Subtransient	0.19	0.18	0.17	0.14	0.22	0.20	0.19	0.18
XL Stator Leakage Reactance	0.06	0.06	0.06	0.05	0.07	0.07	0.06	0.06
X2 Negative Sequence Reactance	0.15	0.14	0.13	0.11	0.17	0.16	0.15	0.14
X0 Zero Sequence Reactance	0.03	0.03	0.03	0.02	0.04	0.03	0.03	0.03
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.61	2.48	2.31	1.97	2.97	2.78	2.63	2.53
X'd Dir. Axis Transient	0.19	0.18	0.17	0.15	0.22	0.21	0.19	0.19
X''d Dir. Axis Subtransient	0.14	0.13	0.13	0.11	0.16	0.15	0.14	0.14
Xq Quad. Axis Reactance	1.78	1.70	1.58	1.35	2.03	1.90	1.80	1.73
X''q Quad. Axis Subtransient	0.23	0.22	0.20	0.17	0.26	0.24	0.23	0.22
XL Stator Leakage Reactance	0.07	0.07	0.06	0.05	0.08	0.08	0.07	0.07
Xlr Rotor Leakage Reactance	0.18	0.17	0.16	0.14	0.21	0.19	0.18	0.18
X2 Negative Sequence Reactance	0.18	0.17	0.15	0.13	0.20	0.19	0.18	0.17
X0 Zero Sequence Reactance	0.04	0.04	0.03	0.03	0.04	0.04	0.04	0.04

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Time Constants (Seconds)		
T'd Transient Time Const.	0.159	
T''d Sub-Transient Time Const.	0.0133	
T'do O.C. Field Time Const.	4.83	
Ta Armature Time Const.	0.0320	
T''q Sub-Transient Time Const.	0.0110	
Resistances in Ohms ( $\Omega$ ) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	0.0006	
Rotor Winding Resistance (Rf)	2.38	
Exciter Stator Winding Resistance	20.1	
Exciter Rotor Winding Resistance per phase	0.057	
PMG Phase Resistance (Rpmg) per phase	1.91	
Positive Sequence Resistance (R1)	0.0008	
Negative Sequence Resistance (R2)	0.0009	
Zero Sequence Resistance (R0)	0.0008	
Saturation Factors	400V	480V
SG1.0	0.331	0.34
SG1.2	1.454	1.303
Mechanical Data		
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	52.23 kgm <sup>2</sup>	51.17 kgm <sup>2</sup>
Weight Wound Stator	1541kg	1541kg
Weight Wound Rotor	1693kg	1651kg
Weight Complete Alternator	4083kg	4054kg
Shipping weight in a Crate	4135kg	4106kg
Packing Crate Size	220 x 105 x 155 (cm)	220 x 105 x 155 (cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL. 6232
Bearing Non-Drive End	BALL. 6319	BALL. 6319

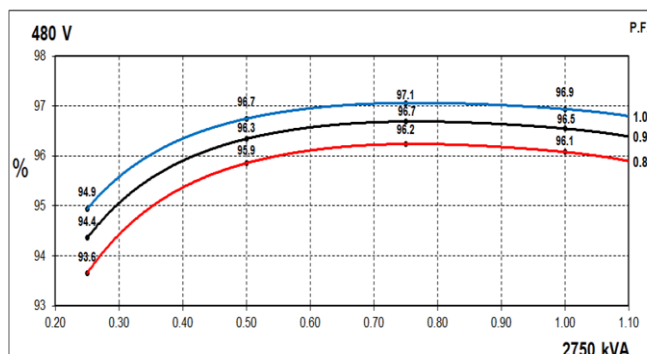
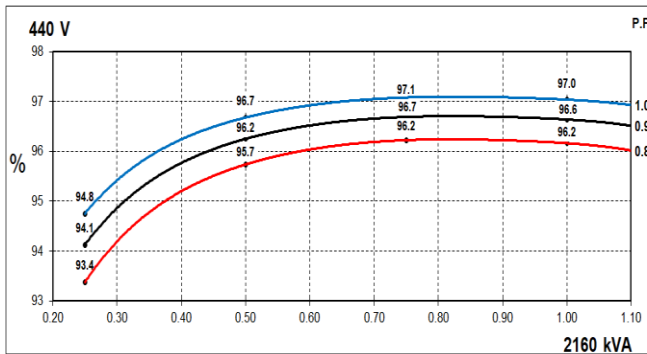
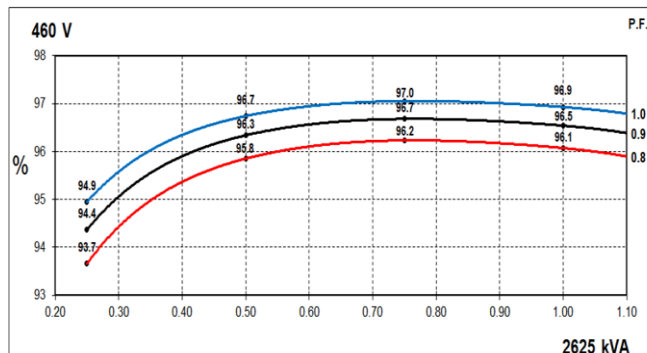
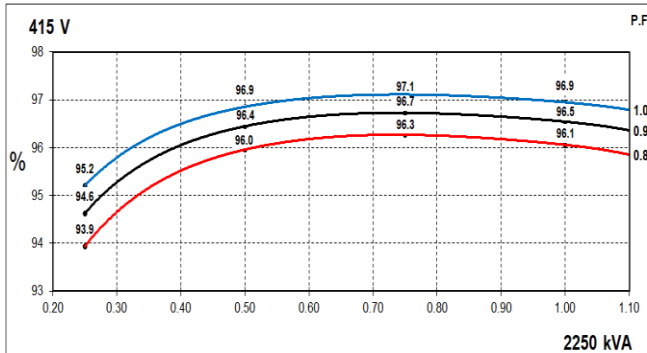
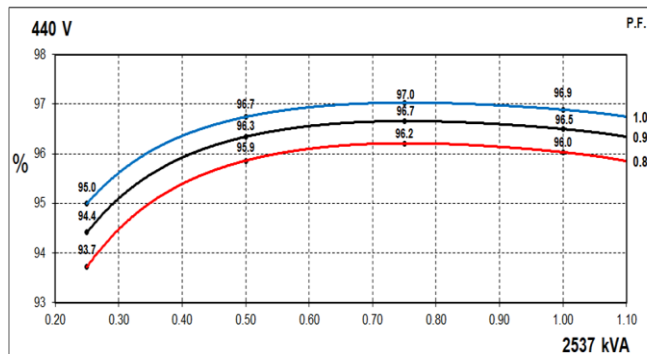
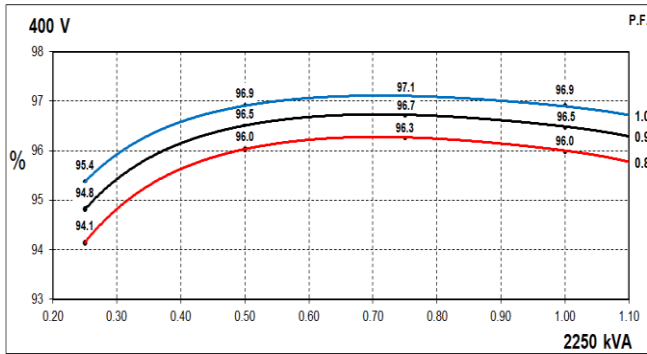
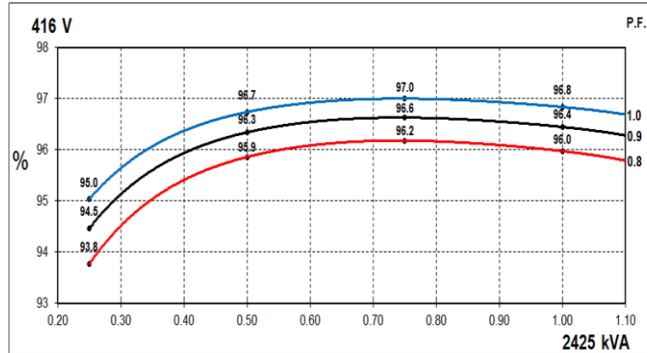
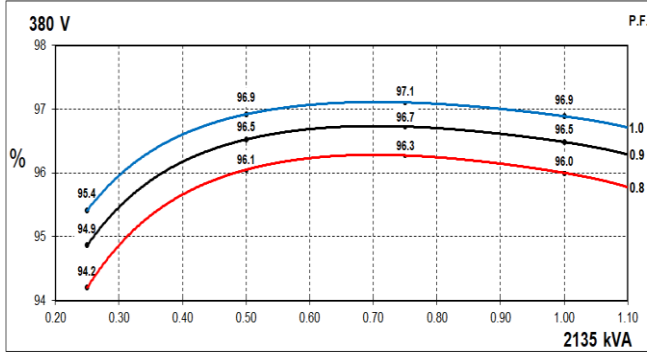
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### THREE PHASE EFFICIENCY CURVES

50Hz

60Hz

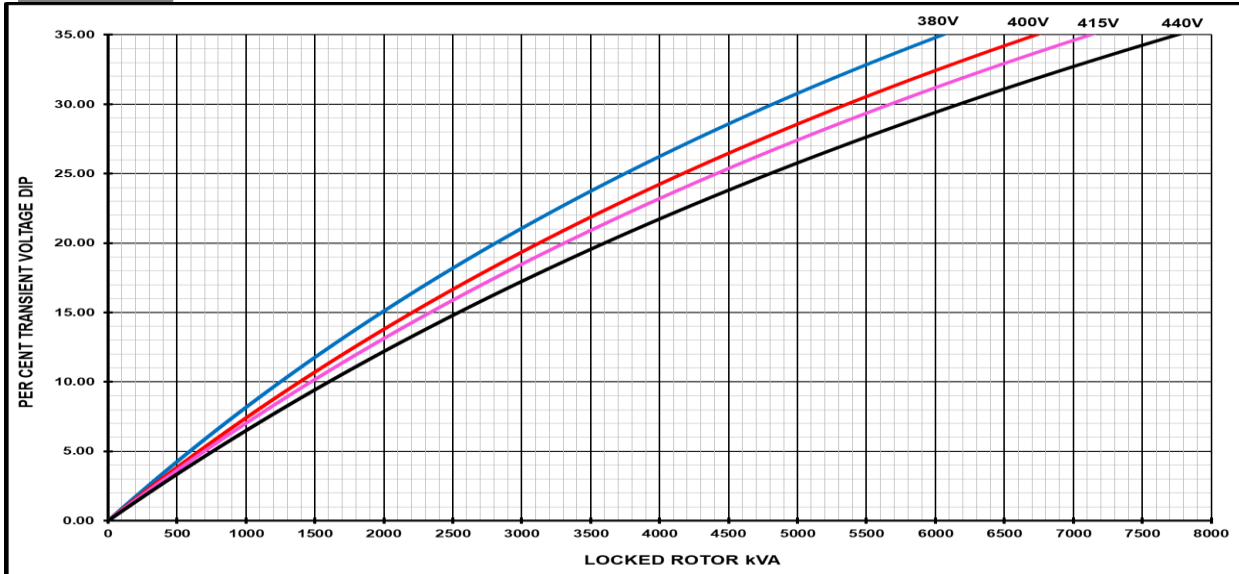


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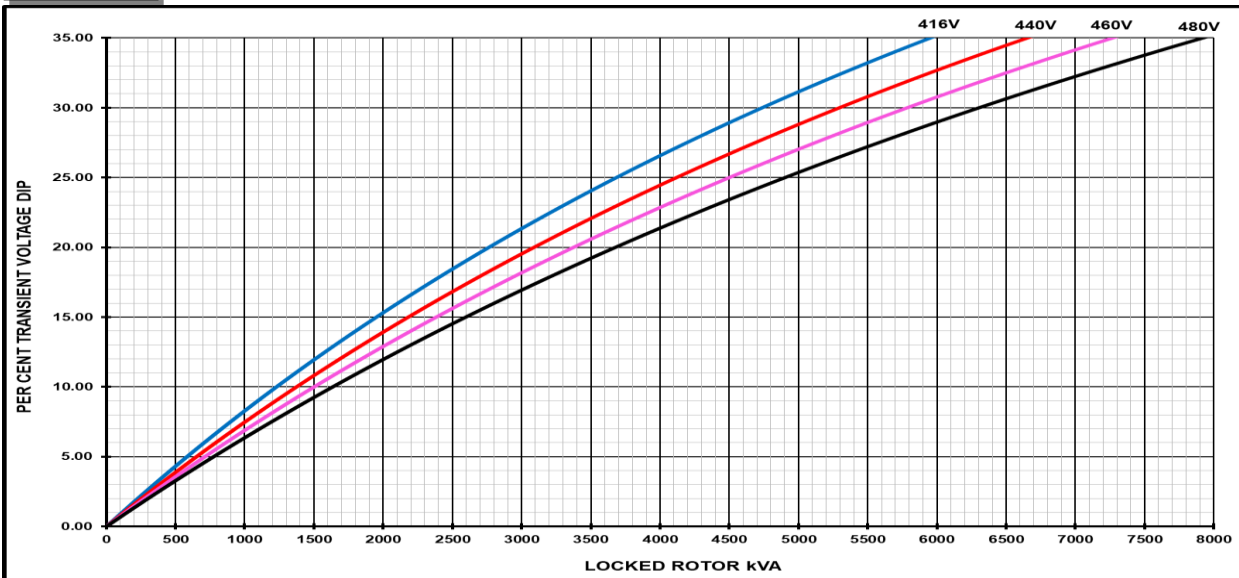
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## Locked Rotor Motor Starting Curves - Separately Excited

**50Hz**



**60Hz**



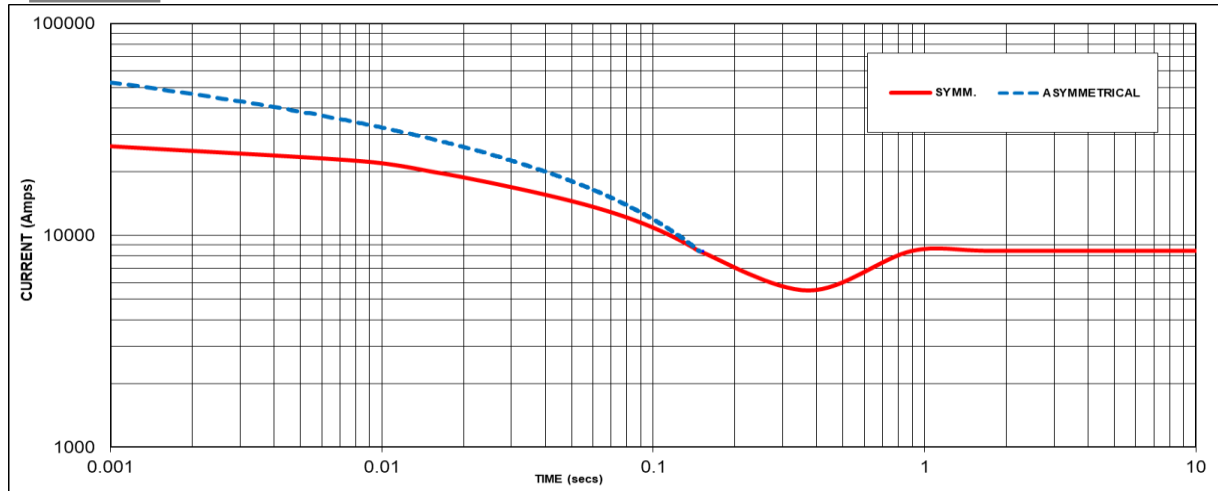
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1	
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

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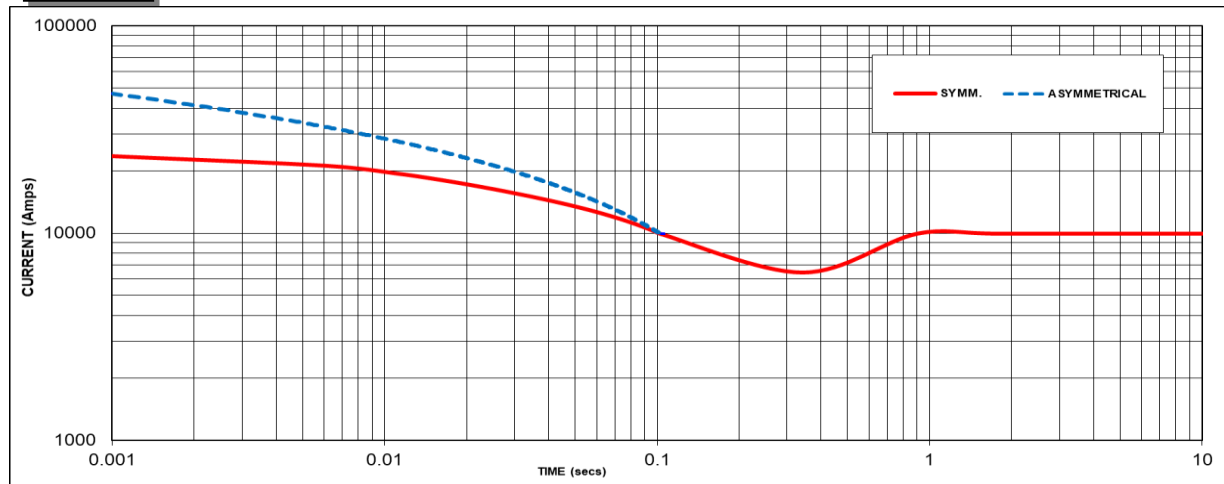
### Three-phase Short Circuit Decrement Curve - Separately Excited

**50Hz**



Sustained Short Circuit = 8453 Amps

**60Hz**



Sustained Short Circuit = 9944 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 :

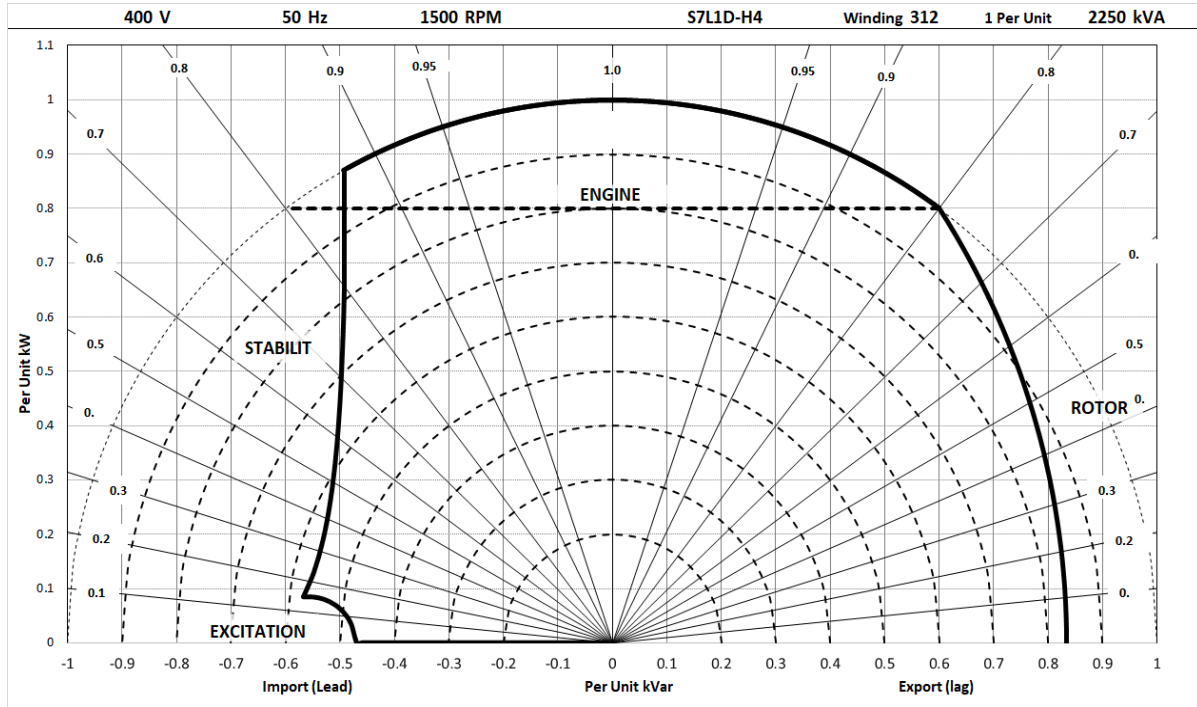
Parallel Star = Curve current value X 2  
 Series Delta = Curve current value X 1.732

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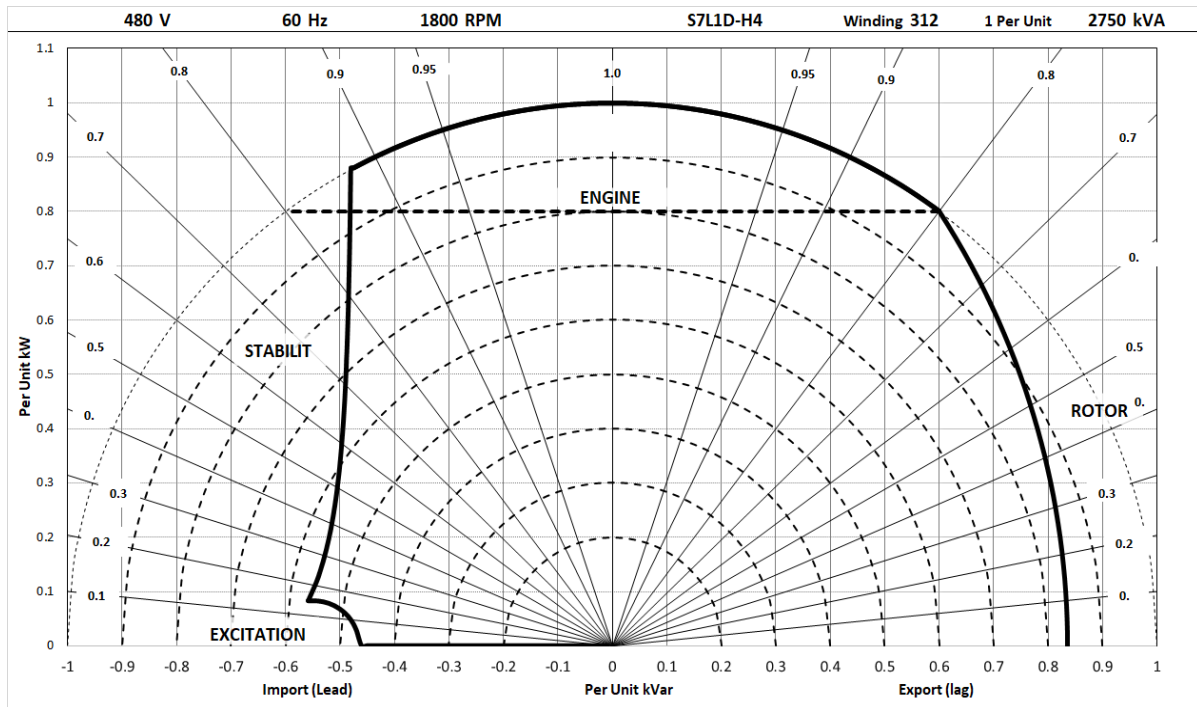
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## Typical Alternator Operating Charts

**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 Hz</b>	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	2290	2400	2400	2310	2225	2340	2340	2250	2135	2250	2250	2160	1985	2090	2090	2005
	kW	1832	1920	1920	1848	1780	1872	1872	1800	1708	1800	1800	1728	1588	1672	1672	1604
	Efficiency (%)	95.9	95.9	95.9	96.1	95.9	95.9	96.0	96.1	96.0	96.0	96.1	96.2	96.1	96.1	96.2	96.2
	kW Input	1911	2003	2001	1923	1856	1952	1950	1873	1779	1875	1874	1797	1652	1740	1739	1667

<b>60 Hz</b>	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	2594	2719	2812	2950	2519	2637	2725	2862	2425	2537	2625	2750	2256	2362	2450	2562
	kW	2075	2175	2250	2360	2015	2110	2180	2290	1940	2030	2100	2200	1805	1890	1960	2050
	Efficiency (%)	95.9	95.9	96.0	96.0	95.9	96.0	96.0	96.0	96.0	96.0	96.1	96.1	96.1	96.1	96.1	96.2
	kW Input	2165	2268	2344	2459	2101	2198	2271	2385	2021	2113	2186	2290	1879	1966	2039	2131

#### 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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