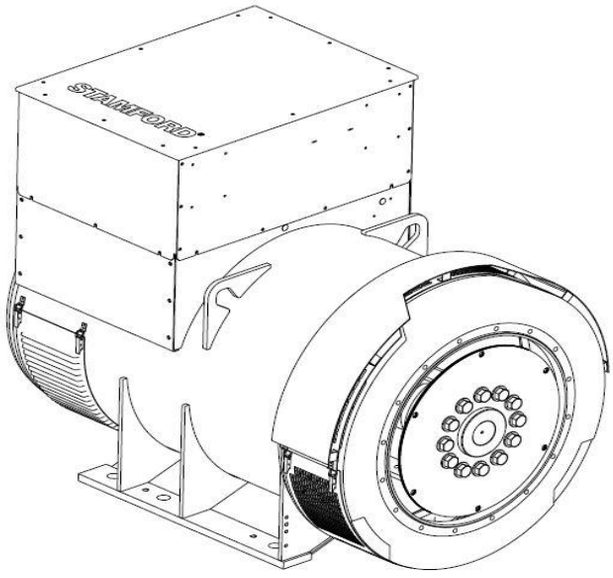
S7L1M-H4 Wdg.312 - Technical Data Sheet

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	MX322	DECS100	DECS150		
Voltage Regulation	± 0.5%	± 0.25%	± 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	26.84							
	50 Hz				60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	2.2 m³/sec				2.64 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)	1880	1980	1980	1910	2137	2237	2312	2425
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	1.92	1.82	1.69	1.45	2.18	2.04	1.93	1.86
X'd Dir. Axis Transient	0.15	0.14	0.13	0.11	0.17	0.16	0.15	0.14
X"d Dir. Axis Subtransient	0.11	0.10	0.09	0.08	0.12	0.11	0.11	0.10
Xq Quad. Axis Reactance	1.52	1.45	1.35	1.16	1.74	1.62	1.54	1.48
X"q Quad. Axis Subtransient	0.17	0.16	0.15	0.13	0.19	0.18	0.17	0.16
XL Stator Leakage Reactance	0.06	0.05	0.05	0.04	0.06	0.06	0.06	0.05
X2 Negative Sequence Reactance	0.13	0.12	0.11	0.10	0.15	0.14	0.13	0.12
X0 Zero Sequence Reactance	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.30	2.19	2.03	1.74	2.62	2.45	2.32	2.23
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	0.13	0.12
Xq Quad. Axis Reactance	1.57	1.49	1.39	1.19	1.79	1.67	1.58	1.52
X"q Quad. Axis Subtransient	0.20	0.19	0.18	0.15	0.23	0.21	0.20	0.19
XL Stator Leakage Reactance	0.06	0.06	0.06	0.05	0.07	0.07	0.06	0.06
Xlr Rotor Leakage Reactance	0.16	0.15	0.14	0.12	0.18	0.17	0.16	0.15
X2 Negative Sequence Reactance	0.15	0.15	0.14	0.12	0.18	0.16	0.16	0.15
X0 Zero Sequence Reactance	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.03

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Time Constants (Seconds)	
T'd Transient Time Const.	0.159
T''d Sub-Transient Time Const.	0.013
T'do O.C. Field Time Const.	4.830
Ta Armature Time Const.	0.032
T''q Sub-Transient Time Const.	0.0110

Resistances in Ohms (Ω) at 22^{0}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	SAE0 , 00	SAE0 , 00
Moment of Inertia	52.23 kgm²	51.17 kgm²
Weight Wound Stator	1980kg	1980kg
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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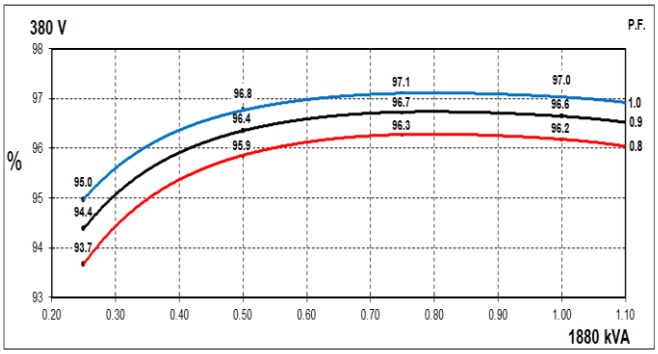
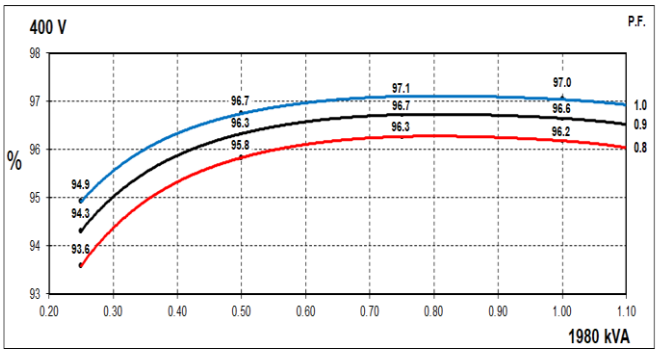
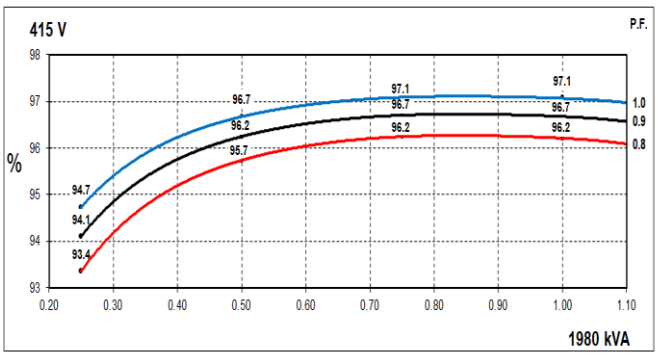
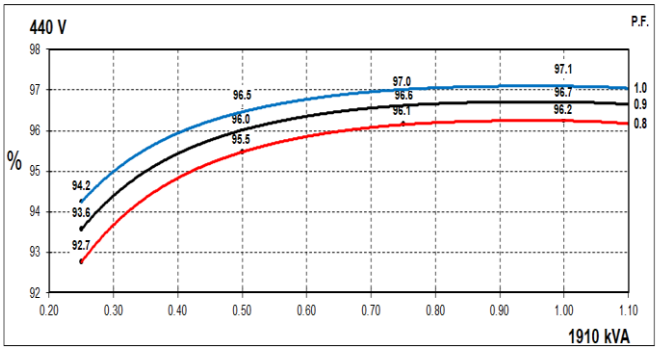
THREE PHASE EFFICIENCY CURVES

50Hz

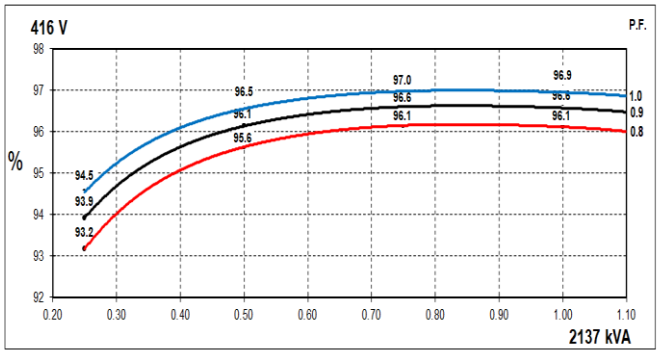


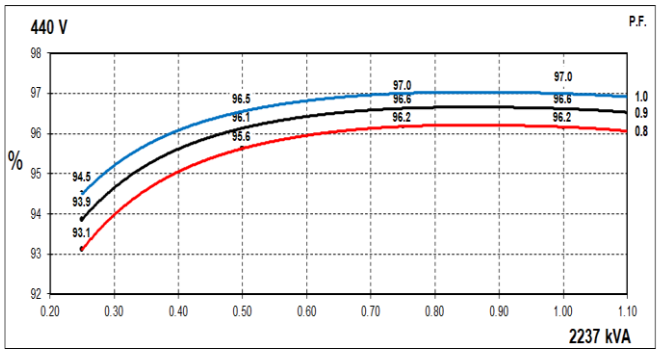


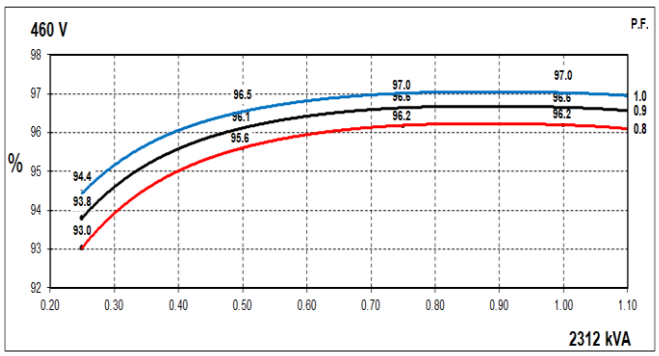


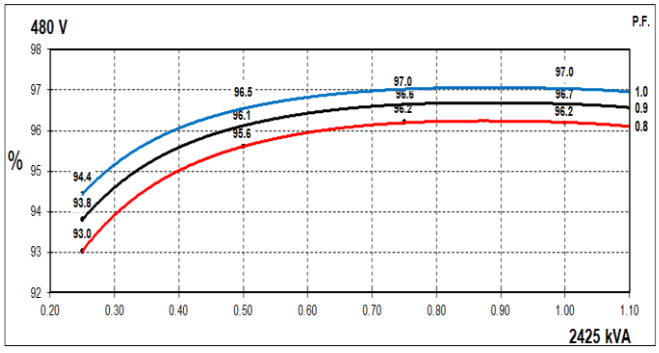


60Hz



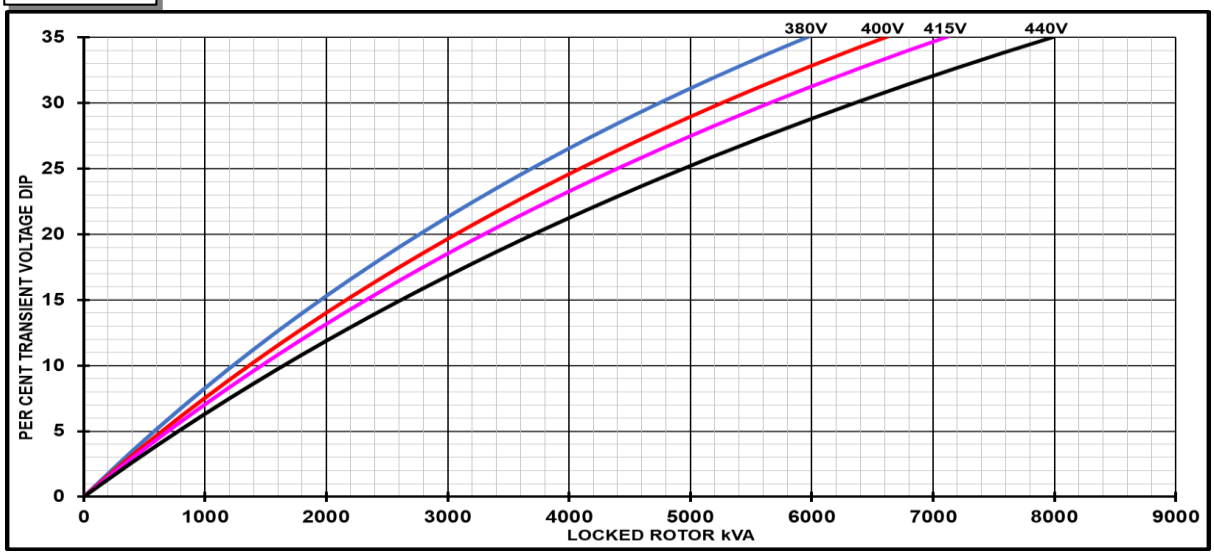




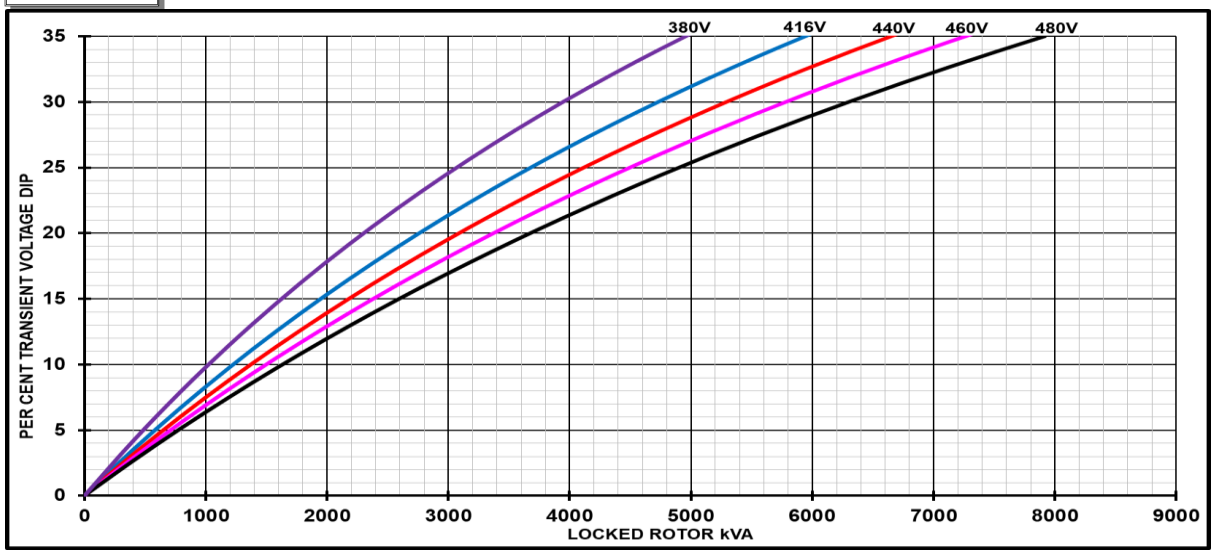


Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor	Lagging PF	Scaling Factor
<= 0.4	1.00	<= 0.4	1.25
0.5	0.95	0.5	1.20
0.6	0.90	0.6	1.15
0.7	0.86	0.7	1.10
0.8	0.83	> 0.7	1.00
0.9	0.75		
0.95	0.70		
1	0.65		

Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

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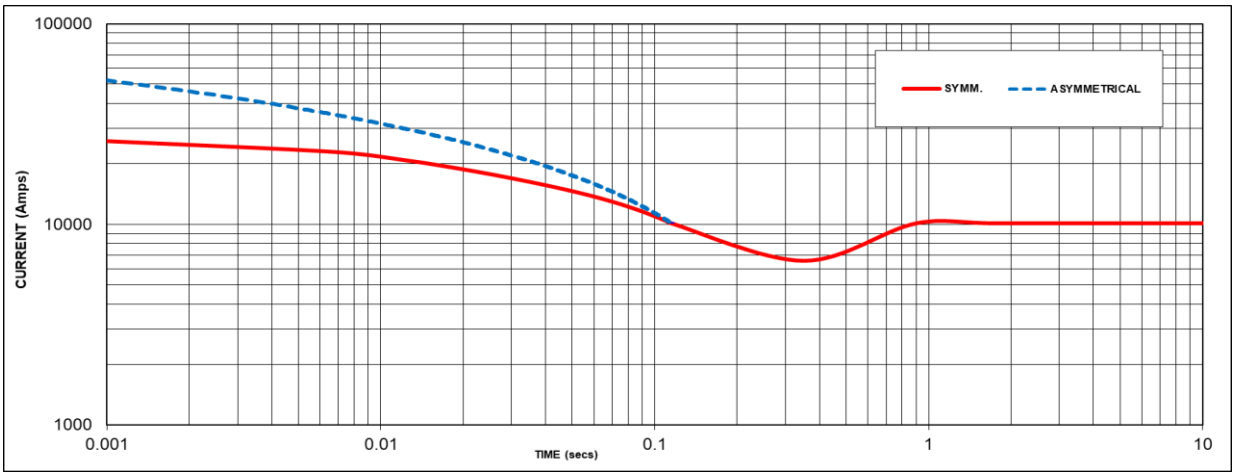
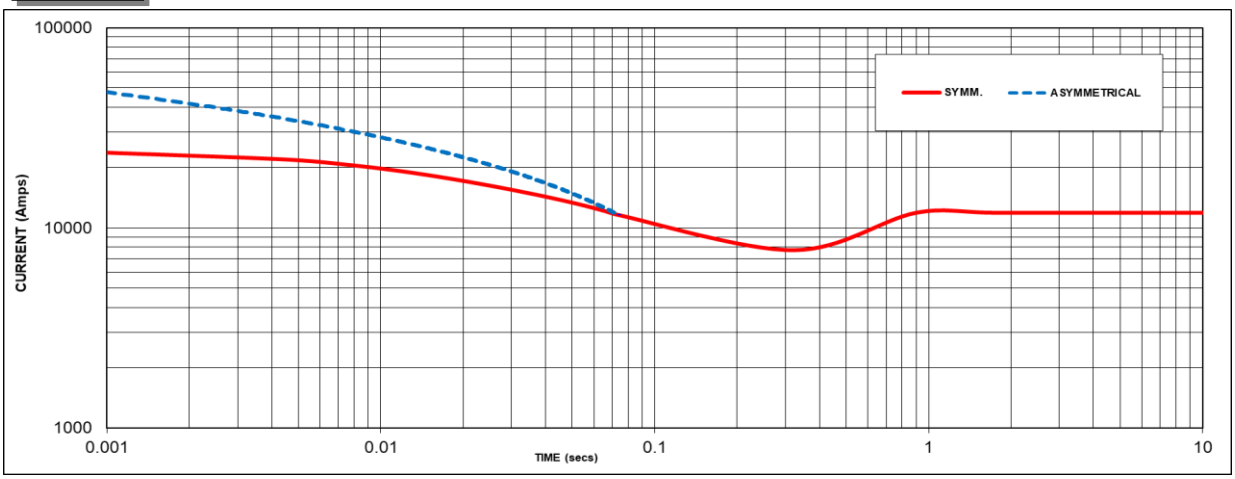
Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz



Sustained Short Circuit = 10144 Amps

60Hz



Sustained Short Circuit = 11933 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 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 3
Curves are drawn for Star connections 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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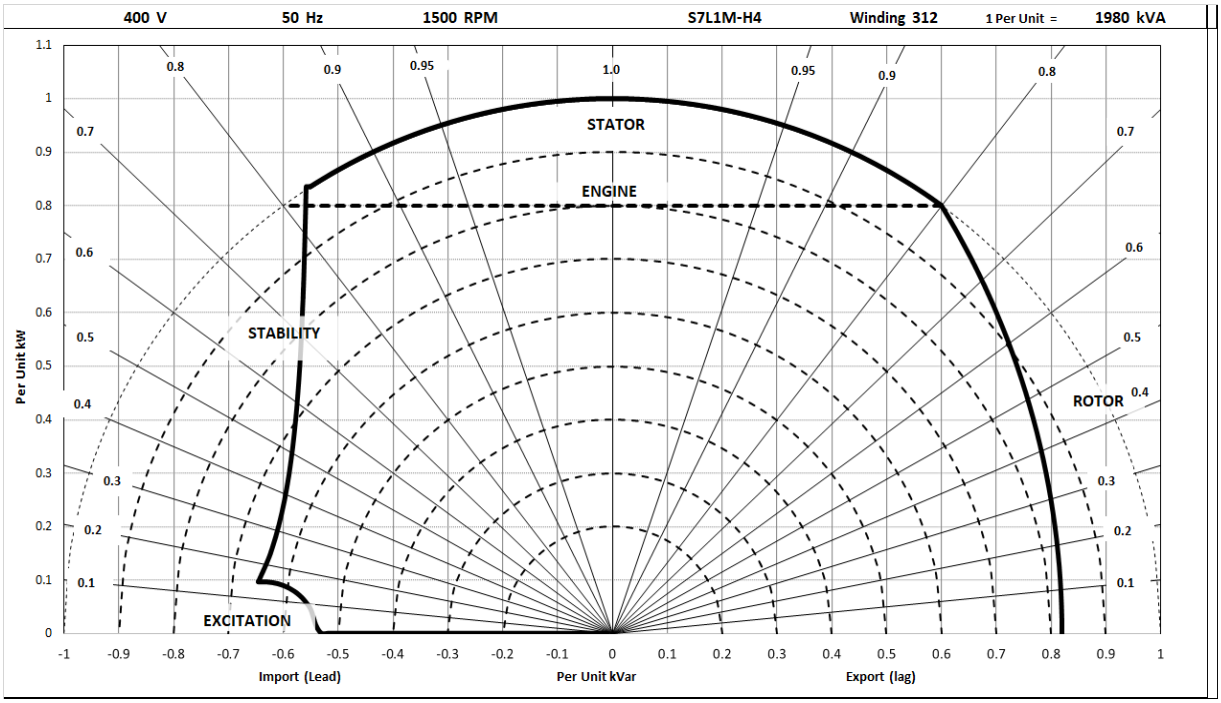
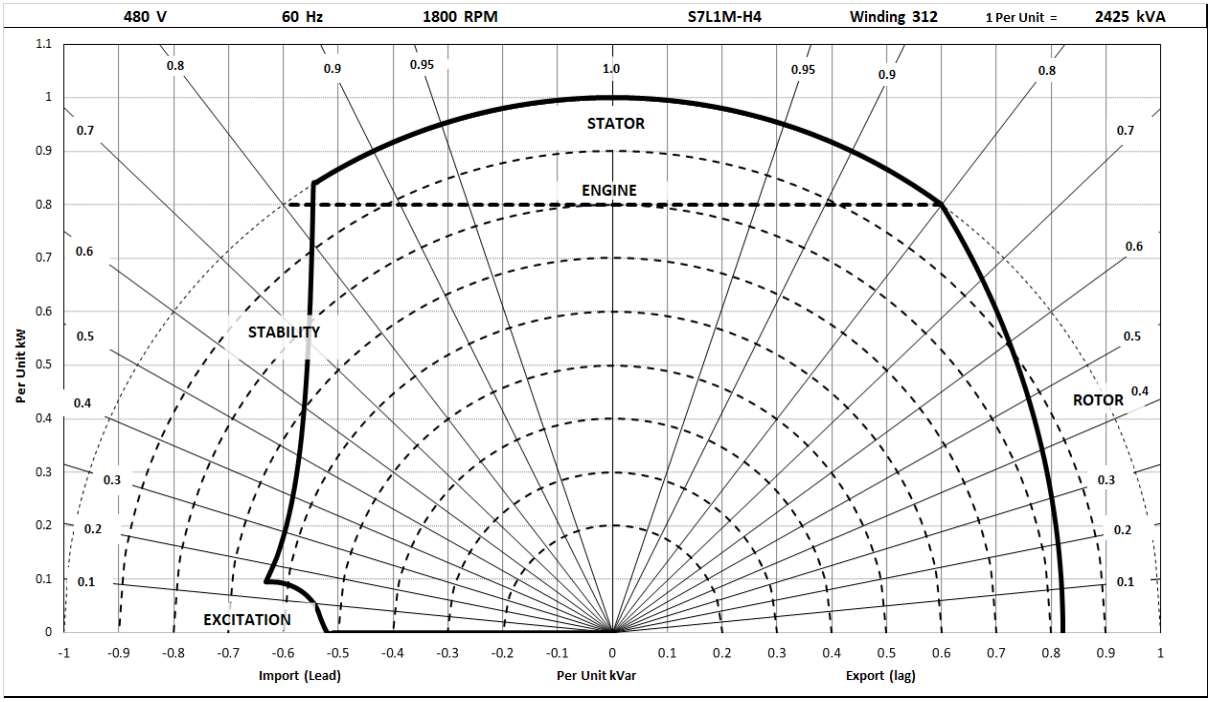
Typical Alternator Operating Charts

400V/50Hz



480V/60Hz



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RATINGS AT 0.8 POWER FACTOR

	Class - Temp Rise	Standby				Cont. H - 110/50°C				Cont. F - 90/50°C				Cont. B - 70/50°C			
50 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	N/A	N/A	N/A	N/A	1880	1980	1980	1910	1740	1795	1795	1760	1535	1585	1585	1550
	kW	N/A	N/A	N/A	N/A	1504	1584	1584	1528	1392	1436	1436	1408	1228	1268	1268	1240
	Efficiency (%)	N/A	N/A	N/A	N/A	96.2	96.2	96.2	96.2	96.2	96.3	96.3	96.3	96.3	96.3	96.3	96.2
	kW Input	N/A	N/A	N/A	N/A	1564	1647	1646	1588	1446	1492	1492	1463	1275	1317	1317	1289

60 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	N/A	N/A	N/A	N/A	2137	2237	2312	2425	2025	2156	2200	2250	1781	1900	1944	1981
	kW	N/A	N/A	N/A	N/A	1710	1790	1850	1940	1620	1725	1760	1800	1425	1520	1555	1585
	Efficiency (%)	N/A	N/A	N/A	N/A	96.1	96.2	96.2	96.2	96.1	96.2	96.2	96.2	96.2	96.2	96.2	96.2
	kW Input	N/A	N/A	N/A	N/A	1779	1861	1923	2017	1685	1793	1829	1870	1481	1580	1616	1647

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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